Meridian 1

Meridian Communications Unit and Meridian Communications Adapter

Description, installation, administration, operation

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Contents

Introduction 9
Reference list 9
Communications software 10
Public Switched Data Service 10
Meridian Communications Adapter 10
Functional description 11
Software support 12
Meridian Communications Unit 12
Processing, power, and protocols 14
Features 14
Related documents 16

Description and operation 17
Reference list 17
Looking at the keypad 17
Using the keypad 17
Using Program key commands 22
MCA keypad dialing 35
MCU keypad dialing features 36
MCU keypad dialing 38
Using the keyboard 44
Special keyboard capabilities 44
Making and answering calls using NT menus 45
Using the Help menus 45
Using the Modify menu 46

Using the Script menu (MCA only) 46
Using the Learn Script/Delete Script menus (MCA only) 46
Rules and information governing NT menu operation 47
Calling with AT commands 49
Dialing modifiers 52
Handling call variations 54
Dealing with access errors 55
Data adapter device 55
Microprocessors 56
RS-232 and V.35 drivers 56
Power 56
8530 communications controller (MCU only) 56
Digital to Analog converters (MCU only) 56
Memory 56
MCA memory configuration 57
MCU memory configuration 57
MCU/MCA Performance 57
Real time analysis 57
DTE/DCE configurations 57
Software 57
Operating parameters 58
Terminal communication 58

Specifications 61

Reference list 61
MCU/MCA parameters 61
RS-232 interface 61
V.35 interface 61
V.25 bis automatic calling 62
Telephone interface 63
Synchronous mode 64
Asynchronous mode 64

MCU power supply 64
MCA power supply 64
EIA RS-232 leads 65
CCITT V.35 leads 67
Power requirements 69
Environmental 69
Reliability 69
MCU/MCA protocols and functional support 70
Protocol adaptation process 70

Installation and maintenance 71

Reference list 71
Configuring the V.35 71
V.35 and MCA 72
V.35 and MCU 72
Adapter cable 75
Cabling 76
DTE interface 77
Configuration 77
Field-replaceable items 78
MCU/MCA LD 11 administration summary 79
Installing and removing the MCU 80
Installation and removal procedures 80
Installing and removing the MCA 82
Power Supply Board 87
Maintenance 91
Troubleshooting asynchronous problems 91
Troubleshooting synchronous problems 93
Troubleshooting the MCA 94
Troubleshooting the MCU 94
Far-end loop back check 95

Index 97

Introduction

Reference list

The following are the references in this section:

- *Meridian Data Features Traffic Engineering and Configuration (553-2731-151)*
- *Meridian Data Features Operations and Tests (553-2731-300)*
- *Meridian 1 Telephones Description and Specifications (553-3001-108)*
- *NT7D16 Data Access Card Description and Operation (553-3001-191)*
- *X11 Features and Services (553-3001-306)*
- *X11 Administration (553-3001-311)*

The Meridian Communications Adapter (MCA) and Meridian Communications Unit (MCU) provide an RS-232C/V.35 interface between compatible asynchronous or synchronous data terminal equipment (DTE) and the Meridian 1 switching network. Both interface with the digital line card (QPC578/NT8D02). MCU/MCA connect to the DTE for intra-switch communications and for wide area communications over Digital Trunk Interface (DTI) or Primary Rate Interface (PRI) links to other Nortel Networks switches.

The MCA fits inside a Meridian Digital Telephone to provide access to data functions. The MCU, available beginning with X11 release 19, is a stand-alone version of the MCA that replicates the functionality of the MCA and provides additional features.

Note: The MCA should be configured with a display to facilitate programming from the telephone keypad.

Most of the information you need to operate the MCA and MCU is available in the following chapter, "Description and operation" on page 17. Read this chapter carefully for information on using the MCU keypad and terminal keyboard. Subsequent chapters contain more technical information on specifications, installation, and troubleshooting.

Communications software

Most commercial MS-DOS and Macintosh communications packages are compatible with the MCU/MCA and personal computers for internal and external communications. Ask your Nortel Networks representative for information.

Public Switched Data Service

The Public Switched Data Service (PSDS) lets you receive data at 56 Kbps over Digital Trunk Interface (DTI) trunks beginning with X11 release 16 and at 64 Kbps over an ISDN Primary Rate Interface (PRI) channel beginning with X11 release 19. It also allows interworking with non-Nortel Networks switches.

Beginning with X11 release 18, set PSDS in LD 11. For more information, refer to the Public Switched Data Service section in *X11 Features and Services (553-3001-306).*

Meridian Communications Adapter

The MCA replaces the MPDA with X11 release 18 and offers enhanced functionality over the MPDA. The MCA may be configured as an MPDA for use with X11 releases 14 through 18. The MCA when combined with the redesigned footstand (January 1998) no longer requires the Power Option board. The MCA data functions are configured using LD 11.

Functional description

The MCA mounts within the telephone and allows synchronous and asynchronous ASCII terminals, and personal computers to connect to the telephone using an RS-232-C or V.35 interface on a DB-25 connector. Beginning with X11 release 14, the MCA also allows synchronous applications (DTEs such as video conferencing equipment and Group IV fax units) to be connected to the telephone.

1.5 MB PRI (QPC720) and 2.0 MB PRI (NT8D782AA) support MCA, although 2.0 MB does not support the on-board protocol converter. MCA supports the DM-DM proprietary protocol for the Meridian 1, the TLink protocol for DMS, and the PSDS protocol for synchronous 64 or 56 Kbps clear data path applications on external trunks only.

X11 releases 14 through 17 allow programming access to data functions through the keypad only. However, X11 release 18 and later allow programming access to data functions using both the keypad and service change in LD 11.

Software support

Meridian 1 fully supports MCA. Table 1 shows the domestic and international support for trunk interworking, configuration, and protocols.

Table 1
Software support

	X11 release 17 (and earlier)	X11 release 18 (and later)	International Software	
			Phase 7C (16.90 G)	Phase 8B
Trunk interworking				
Stand-alone	yes	yes	yes	yes
Private Q.931 network	—	—	yes	yes
ISDN trunks	yes	yes	no	yes
DPNSS/DASS	—	—	no	yes
Configuration				
LD 11	Configure as MPDA	Configure as MPDA or MCA	Configure as MPDA	Configure as MCA
Digital set keypad	yes	yes	yes	yes
Protocols				
DM-DM	yes	yes	yes	yes
TLINK	no	yes	no	yes
PSDS	yes*	yes*	yes	yes
Timed protocol step through	no	yes	no	yes**

* PSDS is available beginning with X11 release 16

**If configured as DTAO=MCA

Meridian Communications Unit

The MCU allows you to transmit and receive data using either PSDS over the

public network or a private network. The MCU, which replaces the QMT21C, is designed for domestic and international use, with transmission speed up to 19.2 Kbps (asynchronous) and 64 Kbps (synchronous), integrated display, and self diagnostics. MCU supports autodialing, ring again, and speed calling as well as autobauding and automatic parity detection. You can use the MCU for

— Video conferencing

— LAN bridging

— Bulk data/PC file transfer

— Dial back-up

— Host connectivity

— MPH connectivity

The MCU fully complies with RS-232C and must be configured as DCE to connect to a terminal, printer, fax machine, or similar peripheral equipment.

> ***Note:*** If you are using MPH mode, the MCU *must* be configured as a DTE. In non-MPH mode, MCU cannot be configured as a DTE.

Unlike MCA, MCU provides dedicated call keys and call progress tones.

The MCU supports the DM-DM, T-Link and PSDS protocols. It also supports V.25 bis, Nortel Networks menu, and AT command dialing interfaces, as well as RS232C, CCITT V.35, CCITT V.24 and RS570/RS449 (with different cables) physical layer one interfaces. The MCU complies with V.28 physical layer one interface for European approval.

Processing, power, and protocols

MCU includes a motherboard that performs all the processing requirements for the data adapter and the interface to the Meridian 1. A daughter board provides a power supply connector (+5, +12, and –12 volts), DB-25 connectors to the data equipment, and RS232/V.35 drivers/receivers for the MCU.

The MCU supports existing MCA features except for Meridian TeleCenter and Voice PCM support. It provides multiple protocols (DM-DM, T-Link, V.25 bis, AT commands, PSDS), dedicated data and feature keys, and call progress tones (provided through a speaker) generated by 8-bit Digital to Analog converters. The unit also includes a display.

Features

Asynchronous features supported by MCA and MCU include:

— Transmission rates of 110 TO 19200 bps

— Enhanced Hayes AT commands, including upper and lower case dialing

— Script file capability that replays a dial-up and log on sequence to access a host or service (MCA only)

— Voice Call Orientation (VCO) capabilities (MCA only)

— Autobaud and autoparity detection

— Host/Terminal mode

— Speed Call

— Forced/Dynamic DTR (Data Terminal Ready)

— Forced/Dynamic DCD (Data Carrier Detect)

— Modem Pool Calling

— Inactivity timeout disconnect

— RTS/CTS hardware flow control for calling another MCU/MCA

Synchronous mode features supported by MCU/MCA include:

— Transmission rates of 1200 to 64000 bps

— Full Duplex transmission up to 64K bps

— Half Duplex transmission up to 19.2K bps

— Internal/External Clocking

— Speed Call (MCU only)

— Modem and Network capability

— Public Switched Data Services (PSDS) capability. MCU/MCA extend PSDS (56K or 64K) and 64K restricted and 64K clear capabilities to modular phones.

— V.25bis dialing protocol supports all synchronous speeds up to 64K. Both High-level Data Link Control (HDLC) and Bisync framing of V.25bis commands are supported.

— Programmable echo canceller disabling for 56K and 64K PSDS calls.

— V.35 hardware interface capability selectable with jumper plugs.

Synchronous *and* asynchronous mode features supported by MCU/MCA include:

— Autodial

— Ring Again

— Display (MCU only)

— Remote Loopback

— Hotline

— Virtual Leased Line

— T-Link and DM-DM protocol support

— T-link and DM-DM are Nortel Networks proprietary protocols. The SL-100 and DMS data services use T-link. Meridian 1 data devices such as ASIM, AIM, SADM and MPDA use DM-DM. MCA and MCU can use both protocols.

Note: Additionally, MCU provides call progress tones and dedicated feature keys for the DDN, Autodial, Ring Again, Speed Call, and display features.

Related documents

For information on data adapters, including MCA, refer to the last chapter of *Meridian 1 Telephones Description and Specifications (553-3001-108)*. For information on related and complementary products, please refer to the following documents:

— *Meridian Communications Adaptor user guide*

— *Meridian Data Features Traffic Engineering and Configuration (553-2731-151)*

— *Meridian Data Features Operations and Tests (553-2731-300)*

— *NT7D16 Data Access Card Description and Operation (553-3001-191)*

— *X11 Administration (553-3001-311)*

Description and operation

Reference list

The following are the references in this section:

- *X11 Administration (553-3001-311)*

This chapter focuses on using the MCU/MCA keypad dialing features, as well as two different dialing protocols (NT menu and AT commands) available from the terminal keyboard.

Looking at the keypad

A standard 12-button pad with digits 0 through 9, *, and # lets you initiate asynchronous or synchronous data calls to local or remote hosts.

Using the keypad

Follow these steps to execute commands using your telephone keypad:

1 Press the Program key.

2 Press the desired digits or symbol from Table 2.

3 Execute the command by pressing the Program key again.

Table 2
Program key commands (Part 1 of 4)

Program Key digits	Definition	Notes
#	Manual data call	MCA only.
*	Release data call	MCA only.
00–09		Program options 00 through 09 are self explanatory and operate similar to how they operate on the Meridian Modular Telephone. Options 01 (Predial Recall) and 03 (Call Timer Enable) are not supported by the MCU.
20	Asynchronous mode	
21	Synchronous mode	Display required.
22	Baud rate	
23	Space parity	
24	Odd parity	
25	Even parity	
26	Mark parity	
27	Host mode	Prompts are not sent to terminal.
28	Terminal mode	Prompts are sent to terminal.
29	Hotline off	Turns hotline off (see Program Key command 30).
30	Hotline on	Auto dials when the MCU/MCA detects a position DTR transition or a carriage return (carriage return not applicable in synchronous mode).
31	Virtual leased line off	Turns leased line off (see Program Key command 32).
32	Virtual leased line on	For applications that require constantly active data call, emulates a dedicated line between terminal and another device.

Table 2
Program key commands (Part 2 of 4)

Program Key digits	Definition	Notes
33	Forced DTR off	Turns forced DTR off (see Program key command 34).
34	Forced DTR on	Forces data call connection even if RS-232 DTR lead is not active. Useful for sending data to a printer or for PC-PC connections where neither PC is configured as host (see Program key command 36).
35	Dynamic carrier detect off	Turns DCD off (see Program key command 36).
36	Dynamic carrier detect on	DCD is constantly high (except for 100 ms after a call is dropped). Included for communication software that requires DCD transition from low to high to activate Answer mode.
37	Remote loopback off	Turns remote loopback off (see Program key command 38).
38	Remote loopback on	Remote loopback is activated for next call.
39	Cancel data ring again	MCA only.
40	Full duplex	
41	Half duplex	Applies to synchronous mode only.
42	Modem mode	MCU/MCA emulates a modem.
43	Network mode	Clocks from a digital network can pass through.
44	Internal clock	Transmitted data clock (DCE mode drives PIN 15 SCT).
45	External clock	Transmitted data clock (DCE mode receives PIN 24).
46	PSDS mode off	Turns PSDS mode off (see P47).
47	PSDS mode on	Use Public Switched Data Services.
48	Enable echo canceller	For PSDS.

Table 2
Program key commands (Part 3 of 4)

Program Key digits	Definition	Notes
49	Disable echo canceller	For PSDS.
50	SL-1 mode	For default mode; see P51.
51	SL-1/DMS-100 mode	When the DMS data unit calls MCU/MCA in synchronous mode, MCU/MCA enters full duplex. To keep MCU/MCA at half duplex, program for SL-100/DMS-100 mode.
54	V.25 bis mode off	
55	V.25 bis mode on	For automatic calls with group IV fax, visit video, video conferencing.
56	Bisynch on	Selects the V.25 bis byte oriented Bisync protocol.
57	HDLC on	Selects the V.25 bis bit oriented HDLC protocol.
58	Assert RTS off	RTS/CTS H/W flow control. Asynchronous mode only.

Table 2
Program key commands (Part 4 of 4)

Program Key digits	Definition	Notes
59	Assert RTS on	H/W flow control disabled.
60	Auto dial programming	MCA only. (For MCU, use dedicated feature key.)
61	Auto dial call	MCA only. (For MCU, use dedicated feature key.)
62	Data parameter display	Applies only to units with display modules.
63	EIA leads status display	Applies only to units with display modules.
64	Monitor data call	Applies only to units with display modules.
65	Reset to default parameters	See procedure 16 for default settings.
66	Emulation selection	Hayes Smartmodem emulation.
67	Lock/unlock data parameters	For locking the operating data parameters.
68	VDN key assignment	MCA only.

Using Program key commands

Procedure 1
RS-232 monitor

A display is needed to use this command.

— Press Program key and dial 63.

The display shows:

TXD	RXD	DCD	DTR	DSR
o	o	•	•	•

This feature is used for troubleshooting. It indicates the status of the EIA leads of the RS-232 device connected to the MCU/MCA. A dark circle means the lead is active.

Note: When in synchronous mode, TXD and RXD are dark. These are not used in synchronous mode, and have no meaning.

Procedure 2
Selecting asynchronous or synchronous mode

A display is recommended to use synchronous mode. Change the baud rate before changing the mode from synchronous to asynchronous.

If an MCU/MCA in synchronous mode calls another data module in asynchronous mode, the call is connected. You must drop the call.

Note 1: If the MCU/MCA is in asynchronous mode, and a long unterminated cable is connected to the DB-25, the MCU/MCA will attempt to autobaud to the noise and will appear to be locked up.

Note 2: If a synchronous DTE is connected to an asynchronous MCU/MCA, the MCU/MCA will constantly try to autobaud and will appear to be locked up. Disconnect the DTE, configure MCU/MCA for synchronous mode and reconnect the DTE.

To select asynchronous mode:

— Press Program key and dial 20.

To select synchronous mode:

— Press Program key and dial 21.

Procedure 3
Data call monitor

A display is needed to use this command.

— Press Program key and dial 64.

The display shows one of the following prompts:

DATA CALL CONNECTED

or

DATA CALL MONITOR CODE

or

INCOMPATIBLE INCOMING CALL RELEASED

or

UNDER TEST (when the far end is in Program key command 38 (Remote Loopback) mode before the call is made)

This simply shows the status of incoming data calls.

Procedure 4
Language selection

1 Press Program key and dial 05.

The display shows the name of the current language selection.

2 Use the volume control to scroll through the possible choices.

The languages listed are those supported by your telephone.

3 Dial the number shown next to the language choice you desire and press the Program key.

Procedure 5
Change baud rate

To set the baud rate for incoming calls or calls made using keypad dialing:

1 Press Program key and dial 22.

BAUD RATE

ENTER DIGITS, THEN P

2 Dial the number of the actual baud rate desired (19200, for example) and press Program key.

INPUT ACCEPTED

or

BAUD RATE

INVALID INPUT, REENTER

Procedure 6
Change parity (asynchronous only)

In asynchronous mode, the MCA is designed to work with 8 bit data characters. You can use various parity settings, but the total character length must equal 8 bits. The MCA accepts the following character lengths and parity settings:

8 data bits, no parity bit
7 data bits + one bit of Even parity
7 data bits + one bit of Odd parity
7 data bits + one bit of Mark parity
7 data bits + one bit of Space parity

For ASCII data, 8 bits no parity equals 7 bits with space parity.

The MCA controls parity only when it displays prompts before the data call is established. In this case, the MCA outputs the prompts to the DTE with the parity settings defined with Program key commands 23-26, or it determines parity automatically with the <CR>. (period) <CR> sequence.

Once the data call is established, the MCA does not check or regenerate parity. The MCA will transport the 8-bit character to the far end with the parity unchanged.

To set parity to space parity:

— Press Program key and dial 23.

To set parity to odd parity:

— Press Program key and dial 24.

To set parity to even parity:

— Press Program key and dial 25.

To set parity to mark parity:

— Press Program key and dial 26.

Procedure 7
Host or Terminal mode (asynchronous only)

To change to host mode:

— Press Program key and dial 27.

Prompts will not be sent to your terminal.

To change to Terminal mode:

— Press Program key and dial 28.

Prompts will be sent to your terminal.

Note: In host mode, even when Forced DTR is turned on, the call will be dropped if DTR is dropped.

Procedure 8
Hotline

To turn Hotline on:

— Press Program key and dial 30.

Keyboard dialing automatically makes calls to the Autodial number. The actual Hotline call is placed when the MCU/MCA sees a positive transition of DTR or detects a carriage return <CR>. Note that <CR> does not apply to synchronous mode.

To turn Hotline off:

— Press Program key and dial 29.

Procedure 9
Virtual Leased Line

To turn on Virtual Leased Line:

— Press Program key and dial 32.

This gives the appearance of a dedicated line between your terminal and the far end data device, for applications that require an active data call at all times. Autodial needs to be programmed before the VLL feature is selected.

To turn off Virtual Leased Line:

— Press Program key and dial 31.

Note: If a power failure occurs while Virtual Leased Line is on, the MCU/MCA will automatically call back the Autodial number when power returns.

Procedure 10
Forced DTR

To turn Forced DTR on (Data Terminal Ready):

— Press Program key and dial 34.

Note: This feature is useful for sending data to a printer or for PC to PC connections where neither is configured as the host.

You can force a data call connection even though the DTR load of the RS-232 is not active.

To turn Forced DTR off:

— Press Program key and dial 33.

Procedure 11
Forced DCD

To turn Forced DCD on:

— Press Program key and dial 35.

Note: This feature is included for those communication software packages that require a transition of Carrier Detect from low (0) to high (1) in order to activate Answer mode.

Data Carrier detect will always be high, except for 100 ms when a call is first dropped.

To turn Forced DCD off:

— Press Program key and dial 36.

Data Carrier Detect will follow the state of the call.

Procedure 12
Remote Loopback

To turn on Remote Loopback:

— Press the Program key and dial 38.

Remote Loopback is activated for the next data call only.

To turn Remote Loopback off:

— Press the Program key and dial 37.

Procedure 13
Inactivity timeout (asynchronous)

The inactivity timeout limit is set by the telephone system administrator. The four settings are: off, 15 minutes, 30 minutes, or one hour.

To see what the Timeout limit is, use display parameters, as described in the following procedure.

Procedure 14
Display parameters

A display is needed to use this command.

1 Press Program key and dial 62.

The display shows Screen 1:

DATA PARAMETER DISPLAY

SCROLL <<<>>>, P TO EXIT

2 You can scroll the display using the volume control key on the phone. It will show MCU/MCA parameters that can be modified through keypad dialing.

The examples below show possible values for each parameter, and their meaning in asynchronous mode.

Screen 2 shows:

DTR OFF BAUD RATE 19200
DCD OFF EVEN PARITY

Screen 3 shows:

VLL OFF TERMINAL MODE
RLB OFF HOTLINE OFF

Screen 4 shows:

RTS ON DEFAULT DM-DM
ASYNCHRONOUS MODE DM-DM IN USE

Screen 5 for MCA shows:

DDN 4100 VDN KEY 0
TIMEOUT OFF

Screen 5 for MCU shows:

DDN 4100
TIMEOUT OFF

Screen 6 shows:

NT KBD DIALING

Abbreviations:
DTR = Data Terminal Ready
DCD = Data Carrier Detect
VLL = Virtual Leased Line
RLB = Remote Loopback
DDN = Data Directory Number

Procedure 15
Lock data parameters

To lock your configuration settings so that no data parameters can be changed (by using Program Key Command-65 or any other command):

1 Press the Program key and dial 67.

2 Using the volume control key, scroll the telephone's display until it reads "DATA PARAMETERS LOCKED."

3 Press the Program key to exit and save the change.

To unlock the parameter settings:

1 Press the Program key and dial 67.

2 Using the volume control key, scroll the telephone's display until it reads "DATA PARAMETERS UNLOCKED."

3 Press the Program key to exit and save the change.

Note 1: Even if parameters are locked, they can be changed for a call. The new parameters are used only for the active call. MCU/MCA returns to the locked parameter settings when the call is released.

Note 2: In the event of a power outage the MCU/MCA will retain all the parameters, including the locked/unlocked state of Program key command 67.

Procedure 16
Reset data parameters

To reset the MCU/MCA configuration to default settings:

— Press the Program key and dial 65.

Note: Unplugging the telephone does not reset MCA configuration.

The data parameters return to the following default settings:

Asynchronous	**Synchronous**
Keyboard dialing	Hotline OFF
Autoanswer	Autoanswer
DTR OFF	DTR OFF
DCD ON	DCD ON
Baud rate 9600	Baud rate 56000
Hot Line OFF	Virtual Leased Line OFF

Asynchronous	Synchronous
Remote Loopback OFF	Remote Loopback OFF
Full duplex	Full duplex
Asserts RTS ON	PSDS OFF
Space parity	Internal clock
Terminal mode	Modem mode
	SL-1 mode
	V.25 bis OFF

Procedure 17
Select emulation (asynchronous only)

To select the modem type that the MCU/MCA will emulate:

1 Press the Program key and dial 66.

2 Using the volume control key, scroll the telephone's display until the correct modem type appears.

3 Press the Program key to exit and save the emulation setting.

Possible emulation settings are:

SMARTMODEM 2400
SMARTMODEM 2400
SMARTMODEM 1200
NT KBD DIALING

Note 1: Unless NT keyboard dialing is selected as the emulation type, <CR> autobaud is disabled and pressing <CR> does not display the Main menu. Smartmodem emulation only supports Hayes (AT) commands.

Note 2: Some software packages require Forced DTR to be turned on in order to work properly. Turn on Forced DTR (see Program key command 34) if the above procedure fails.

Note 3: If power is dropped while emulating Smartmodem 1200 or 2400, the selection defaults to Smartmodem 9600 upon power up. This does not apply to NT KBD dialing.

Procedure 18
Full duplex/Half duplex (synchronous only)

These two modes allow you to choose either half or full duplex data transmission while in synchronous mode. MCU/MCA supports full duplex transmission for rates of up to 64K bps and half duplex transmission of up to 19.2K bps.

To choose full duplex:

— Press the Program key and dial 40.

To choose half duplex:

— Press the Program key and dial 41.

Procedure 19
Modem/Network (synchronous only)

When the modem mode is selected and you are in synchronous mode, the MCU/MCA emulates a modem. In network mode, the MCU/MCA allows clocks from a digital network to pass through.

To choose modem mode:

— Press the Program key and dial 42.

To choose network mode:

— Press the Program key and dial 43.

Procedure 20
External Clock/Internal Clock (synchronous only)

Use the external clock if you want the Meridian 1 phone to receive and transmit the bit-timing signal from the DTE. Use the internal clock if the Meridian 1 phone is to provide the bit-timing signal.

To use the external clock:

— Press the Program key and dial 45.

To use the internal clock:

— Press the Program key and dial 44.

Procedure 21
SL-1/SL-100/DMS (synchronous only)

Due to the differences between the MCU/MCA and the SL-100/DMS Data Unit (DU), when the DU calls an MCU/MCA in synchronous mode, the MCU/MCA always enters full duplex mode. If half duplex mode is preferred, program the MCA for SL-100/DMS mode. The MCU/MCA will still answer a SL-100 DMS/DU call automatically, but will remain in half duplex mode.

To program SL-100/DMS:

— Press the Program key and dial 50 for SL-1.

— Press the Program key and dial 51 for SL-100/DMS.

Procedure 22
PSDS On/Off (synchronous only)

When PSDS is turned on you can use the Public Switched Data Services (PSDS) feature.

To turn PSDS off:

— Press the Program key and dial 46.

To turn PSDS on:

— Press the Program key and dial 47.

Note: If the called side is in PSDS mode, the calling side will automatically step through to PSDS mode. However the calling side will not send the 2100Hz tone, since the echo canceler is off. If the tone is required, the calling side must be programmed to PSDS on (P47) and the echo canceler must be programmed to on (P48).

Procedure 23
Echo canceller (synchronous only)

Echo canceller is available when PSDS is turned on.

To turn echo canceller on:

— Press the Program key and dial 48.

To turn echo canceler off:

— Press the Program key and dial 49.

Procedure 24
V.25 bis mode (synchronous only)

This feature allows you to answer calls automatically with DTE.

To program V.25 bis:

— Press the Program key and dial 54 to turn V.25 bis off.

— Press the Program key and dial 55 to turn V.25 bis on.

When V.25 bis (P55) is turned on, the MCU/MCA automatically switches to synchronous mode and Forced DTR is turned off. No auto-answer is provided while in the V.25 mode.

— Press the Program key and dial 56 for bisync on.

This is required for video equipment.

— Press the Program key and dial 57 for HDLC protocol.

This is required for G4 FAX.

Procedure 25
RTS ON/OFF (asynchronous only)

When RTS is on the MCU/MCA forces the RTS lead active and assumes the local DTE is always ready to transmit or receive data. There is no flow control.

Turning RTS off allows RTS/CTS hardware flow control handshaking. The local DTE can stop the data flow by dropping the RTS lead and the MCU/MCA will drop the CTS lead. The MCU/MCA then sends a message to the far end to drop the CTS lead. When the DTE is ready, it starts the flow by raising the RTS lead. The MCU/MCA raises the CTS lead and the data transmits again.

Using flow controls (RTS OFF) allows the MCU/MCA to operate with printers or other DTE devices that also use flow control.

To turn RTS forcing on (no flow control):

— Press the Program key and dial 58.

To turn RTS forcing off (activate flow control):

— Press the Program key and dial 59.

Procedure 26
VDN key assignment (MCA, asynchronous only)

Use this feature when your telephone is programmed to have more than one Voice DN (VDN). This assigns the VDN of your choice to originate voice calls through the MCA. If your VDN is on a key other than zero, use this assignment to ensure the correct key is used for voice calls.

To use VDN key assignment:

1 Press the Program key and dial 68.

The following appears on your display:

VOICE DN KEY (0-5)

ENTER DIGITS, THEN P

2 Enter the desired key number and press Program key to assign it.

Procedure 27
Voice call origination (using the MCA secondary channel)

By using a special cable, the MCA can communicate with two DTEs at the same time. The primary channel is the main communication channel offering MCA features. The second channel can respond to Voice Call Origination commands (VCO) only. This provides the ability to make a voice call across the second channel while simultaneously using the primary channel to transmit or receive high speed data. Below is the pinout list to connect the second channel.

Note: The second channel VCO baud rate is 2400.

	RS-232 Pin	**V.35 Pin**
TxD	14	18
RxD	16	21
GND	7	7

The following commands are available with VCO operation.

ATDP
ATF3
ATF4
ATF5
ATHP
ATTSP!

For a brief description of these commands, refer to “AT commands” on page 49.

MCA keypad dialing

Keypad dialing is available in synchronous and asynchronous mode. The answering data module always adapts to the calling data module parameters.

Procedure 28
Making manual data calls

To make a manual data call:

1. Press the Program key, followed by an octothorpe (#).
2. If you do not have a display, enter the number, followed by the Program key
3. If you have a display, at the following prompt enter the number and then the Program key.

   MDIAL
   ENTER DIGITS, P to EXIT

   The screen confirms the connection:

   DATA CALL CONNECTED

Procedure 29
Autodialing

To autodial:

— Press the Program key, and dial 61.

To program the autodialer:

1. Press the Program key, and dial 60.
2. If you do not have a display, enter the desired number followed by the Program key.
3. If you have a display, at the following prompt enter the number, and then the Program key.

   ADIAL
   ENTER DIGITS, THEN P

Procedure 30
Making Ring Again calls

If the manual or automatically dialed number is busy, Ring Again is automatically placed.

If you have a display, you see the message:

RING AGAIN PLACED

To verify the connection:

— Press Program key and dial 64.

The display reads:

DATA CALL CONNECTED

To cancel a Ring Again:

1 Press the Program key and dial 39.

2 If you do not have a display, press the Program key again.

3 If you have a display, at the following prompt press the Program key to exit.

RING AGAIN CANCELLED
ENTER P to EXIT

MCU keypad dialing features

The MCU has the following feature keys:

— Speed Call: lets you call a directory number (DN) using a code of up to three digits. Any number of users can be assigned to any list, although it is unwise to combine voice and data entries on the same list.

— Autodial: lets you program the module with a frequently used number that is automatically dialed.

— Ring Again: allows queuing of calls to busy DNs within a customer group, alerts the caller when the busy DN is free, and provides automatic callback to the DN.

— Data Directory Number (DDN): allows you to answer an incoming call manually or to initiate a data call using keypad dialing.

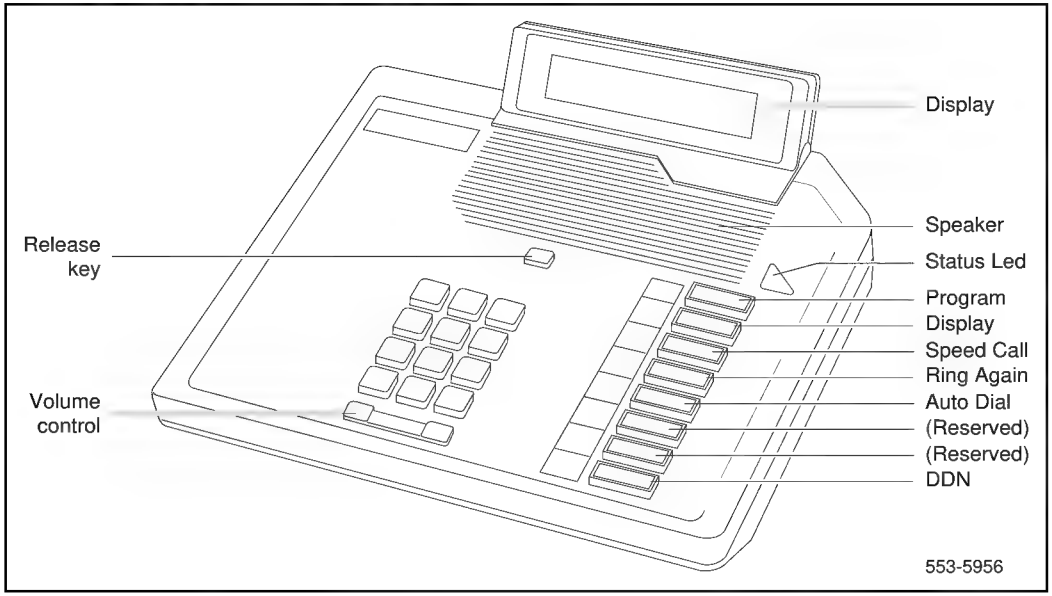
— Display: to display autodial and speed call numbers

— Program, described in "Looking at the keypad" on page 17.

— Release: lets you disconnect a call.

Figure 1 shows the MCU.

Figure 1
Meridian Communications Unit



MCU keypad dialing

The following procedures describe how to use the various features. You will probably only use one or two features at a time.

Procedure 31
Initiating MCU keypad dialing

Make sure the data station is idle and the MCU power is on.

1 If you have data Autodial, see "Autodial" on page 39. If not, go to Step 3.

DN must be equipped with Autodial.

2 If you have Speed Call, see "Speed Call" on page 39. If not, go to Step 3.

DN must be equipped with Speed Call.

3 Press the DDN key.

The DDN LCD lights up and the display appears blank. You hear a dial tone. See the following procedures to call a local host or smart modem or a dumb modem pool.

Procedure 32
Calling a local host or a smart modem pool

1 After initiating MCU keypad dialing (see the previous procedure), enter the number.

You can enter any number, as well as # and *.

MCU sends the digits to the switch, which places the call to the host. The digits appear on the display. The MCU receives a Ringback tone.

The Ringback tone turns off when the call is answered. The data modules perform handshake and the data channel becomes transparent.

The data module connected to the host answers, the status LED goes on and the following prompt appears on the DTE monitor if you are in asynchronous mode:

CALL CONNECTED
SESSION STARTS

2 If the called host is busy, see "Activating Ring Again" on page 40.

3 Once the data session begins, follow the log in procedures and proceed with the data session.

The host echoes all typed input. When you are ready to disconnect, see "Disconnecting a call" on page 42.

Procedure 33
Autodial

If Autodial is active:

1 Press the DDN key.

The DDN LCD is on, and you hear a dial tone.

2 Press the Autodial key.

The display shows the previously programmed Autodial number. The switch places the call to the predesignated number.

When the call answers, the status LED goes on and the following prompt appears on the DTE monitor:

CALL CONNECTED
SESSION STARTS

3 If the called host is busy, see "Activating Ring Again" on page 40.

4 Once the data session begins, follow the log in procedures and proceed with the data session.

The host echoes all typed input. When you are ready to disconnect, see "Disconnecting a call" on page 42.

Procedure 34
Speed Call

Your speed call numbers must be programmed in the database associated with your DDN.

If Speed Call is active:

1 Press the DDN key.

The DDN LCD turns on and you hear a dial tone.

2 Press the Speed Call Key.

The Speed Call LCD turns on and the dial tone turns off.

3 Enter the 1-, 2-, or 3-digit code to access the number to be dialed.

The Speed Call LCD turns off and you hear a Ringback tone. The switch calls the stored number. The LCD turns on, the Ringback tone turns off, and you will hear tones indicating the call is in progress. The data modules perform handshake and the data channel becomes transparent.

When the call answers, the status LED goes on and the following prompt appears on the DTE monitor:

CALL CONNECTED
SESSION STARTS

4 If the called host is busy, see "Activating Ring Again" on page 40.

5 Once the data session begins, follow the log in procedures and proceed with the data session.

The host echoes all typed input.

6 When you are ready to disconnect, see "Disconnecting a call" on page 42.

Procedure 35
Activating Ring Again

If Ring Again is active and you have called and the host is busy, you will hear a busy tone and see the prompt:

DESTINATION BUSY
ACTIVATE RING AGAIN

If you do not have Ring Again and the host is busy, the DDN LCD flashes. Release the DDN key

To activate Ring Again:

1 Press Ring Again once.

You can cancel Ring Again at any time before call completion by pressing Ring Again a second time.

If Ring Again is active, the Ring Again LCD turns on and the DDN LCD turns off. If Ring Again is cancelled, the Ring Again LCD turns off.

When the called port becomes free, the Ring Again LCD blinks and you see the prompt:

RING AGAIN READY
SELECT LINE, RING AGAIN?

2 Press the DDN key and then the Ring Again key.

The status LED goes on and the following prompt appears on the DTE monitor if you are in asynchronous mode:

CALL CONNECTED
SESSION STARTS

The Ring Again LCD turns off, the Ringback tone turns off, and the called port number is displayed.

3 Once the data session begins, follow the log in procedures and proceed with the data session.

The host echoes all typed input.

4 When you are ready to disconnect, see "Disconnecting a call" on page 42.

Procedure 36
Disconnecting a call

1 Enter a disconnect command to terminate the session, and to initiate call disconnect by the host terminal.

For local host disconnection, the device (ADM, MCDS, DAC, MCU) connected to the host must be configured to monitor the host DTR. For disconnection by a remote host, the host modem must be configured to monitor the host DTR.

Entering a disconnect command causes the host to drop DTR and release the connection.

or

Press the Release key.

or

Press the break key for 1.6 seconds (asynchronous only).

For terminals with overlapping timed breaks, press the break key several times.

Note: This method does not work on terminals with non-overlapping timed breaks.

or

Use three short breaks at least 100 ms long within one second

When the call disconnects, the time and date appear on the display. The DDN LCD and the status LED are off.

Procedure 37
Program or modify Autodial

1 Press the Autodial key (do not press the DDN key).

The Autodial LCD blinks, and you see the prompt:

PROGRAMMING AUTODIAL
ENTER NUMBER

2 Enter the new number.

The display shows the digits you entered and shows the prompt:

PRESS AUTODIAL TO SAVE

3 Press the Autodial key.

The Audodial number is changed to the new number.The Autodial LCD turns off and the display returns to the idle state.

Procedure 38
Program or modify Speed Call

1 Press Speed Call key (do not press the DDN key).

The Speed Call LCD blinks and you see the prompt:

PROGRAMMING SPEED CALL
ENTER CODE AND NUMBER

2 Dial the 1-, 2-, or 3-digit access code.

3 Dial the Speed Call number.

Include * and # where necessary. The code and number appear on the display. The following prompt appears:

PRESS SPEED CALL TO SAVE

4 Press the Speed Call Key.

The Speed Call LCD turns off and the display returns to idle. The Speed call list now contains the new entry.

5 To program additional numbers, repeat these steps. Use a different access code for each number.

Using the keyboard

You can initiate data calls to local or remote hosts using the terminal keyboard of a DTE. Keyboard dialing capability is available only for ASCII, asynchronous, character mode, interactive terminals equipped with an RS-232 interface and connected to the MCU/MCA. For most calls, the keypad commands are adequate. However, more sophisticated communications applications (for example, those that interface with other software) require keyboard input.

NT menu and AT commands are the two protocols available for keyboard dialing. NT menu is the Nortel Networks standard. AT is the Hayes Smartmodem standard.

> ***Note:*** The answering data module always adapts its mode to the calling data module.

Special keyboard capabilities

The keyboard has many of the same calling features as the keypad. In addition, the keyboard provides:

— Autobaud. After autobauding, MCU/MCA remembers the current speed.

— Autoparity. MCU/MCA detects the carriage return character speed. If the terminal parity matches the 8-bit no parity default, a legible prompt appears. If a legible prompt does not appear, you need to enter a period, followed by a carriage return to force the MCU/MCA to detect the parity.

— Asynchronous data baud rates of 110, 150, 300, 600, 1200, 2400, 4800. 9600, and 19200 bps.

— Two stop bits for 110 bps and one bit for other baud rates.

— A menu driven interface (NT proprietary).

Making and answering calls using NT menus

NT protocols simplify the process of making and answering calls while providing features that can speed or automate calling.

Procedure 39
Making calls

1 Enter a carriage return to display the following prompt:

ENTER NUMBER OR H (FOR HELP)

2 Type the number desired.

or

Press H to access the Help menus.

Normally, the call is answered and you begin the login procedures required by the host terminal. For information on call variations (busy signals, digital trunk calls, smart modem pool calls) see "Handling call variations" on page 54.

Using the Help menus

Pressing H produces a Command menu with six selections:

A - AUTODIAL Select to automatically dial the stored number.

C - CALL Select, then enter telephone number. The result is the same as if the number had been entered in response to the original prompt.

D - DISPLAY Displays terminal parameters.

S - SPEED CALL After entering access code, the system speed dials the predesignated number.

M - MODIFY Accesses the Modify menu (see the following section).

F - SCRIPT FILE DIRECTORY Lists the script files that currently reside in the user's directory (applies only to MCA).

Using the Modify menu

Select M from the Command menu to access the Modify menu.

A - AUTO NUMBER You are prompted with the message **AUTO DIAL NO** to enter the new number to be stored for automatic dialing.

S - SPEED NUMBER You are prompted to ENTER ACCESS CODE, then to enter a new SPEED NUMBER.

R - REMOTE LOOPBACK You are prompted with REMOTE LOOPBACK (Y/N).

M - MANUAL ANSWER You are prompted with MANUAL ANSWER (Y/N), where a no response indicates automatic answer.

Q - QUIT MODIFY Exits the Modify menu.

F - SCRIPT FILE (for MCA only): Accesses the Script menu (see the following section).

Using the Script menu (MCA only)

Select F from the Modify menu to access the Script menu.

C - LEARN SCRIPT Accesses Learn Script menu (see the following section).

D - DELETE SCRIPT Accesses Delete Script menu (see the following section).

E - ESCAPE CODE

Q - QUIT Exits the Script menu.

Using the Learn Script/Delete Script menus (MCA only)

The Learn Script and Delete Script menus have similar prompts:

A - LEARN/DELETE AUTO DIAL SCRIPT Allows you to create or delete an autodial script.

S - LEARN/DELETE SPEED CALL SCRIPT Allows you to create or delete a speed call script.

D - SCRIPT FILE DIRECTORY Lists the script files in your directory.

Q - QUIT Exits menu.

Procedure 40
Answering calls

Unless Manual Answer is turned on ("Using the Modify menu" on page 46), calls are answered automatically.

1 When Manual Answer is turned on, the calling number appears on the screen followed by the message:

INCOMING CALL. ANSWER? (Y/N<Y>)

2 To answer the call, type a <CR> or a Y, followed by a <CR>.

Usually you will see an **INCOMING CALL CONNECTED** message. For other possible responses, see the following section.

Rules and information governing NT menu operation

The following rules apply to NT dialing:

— The data terminal must be on-line. Both the terminal and the MCU/MCA must be turned on.

— Make sure that any special features have been programmed. (If you access Speed Call or Autodial and no number has been programmed, the message NOT IN SERVICE appears and the call is released.)

— Typed input may be in lower or upper case and must be terminated by a carriage return (or equivalent).

— Edit input using the backspace or delete keys or their equivalents.

— All prompts and messages in setup appear in upper case. Prompts that require you to input information are followed by a colon and a space (:). All messages are followed by a semicolon and carriage return or line feed.

— Dial a call using the keyboard numbers and *, and #. No other characters are accepted. Typing invalid characters displays the message INVALID COMMAND/ENTRY followed by the prompt to REENTER.

— A call to an invalid number produces a NOT IN SERVICE message and releases the call.

— Abandon an asynchronous call during setup by using <Ctrl-Z>.

- If you receive a call from someone who has requested a data loopback, the display shows the message UNDER TEST instead of the message DATA CALL CONNECTED.
- If the call cannot be completed even though the station is not busy, the message SERVICE UNAVAILABLE CALL RELEASED appears.
- If you change the terminal speed and do not re-autobaud, the system prompt may contain unreadable characters. Enter a <CR> to force an autobaud.
- If an incoming call has a mismatched baud rate or unsupported data pattern, you will receive the message INCOMPATIBLE INCOMING CALL.
- Return to the menu any time you receive the prompt REENTER.
- If the DN has a digit display feature, the digits appear as the system sends them.

Calling with AT commands

AT commands are appropriate for calls that interface with other software applications. The AT standard is universally accepted, but requires more keystrokes than NT.

Procedure 41
Making an AT call

1 Press <Ctrl-Z>.

AT commands are prefixed with the letters AT.

2 Type the AT command and press <CR>.

Table 3 shows the calling commands available with AT. Command lines are limited to a maximum of 40 characters, not including the AT and spaces.

The letter "n" represents a digit or symbol (0-9, #, *) dialed. If you omit the digit, the system assumes that the parameter is zero. Commands have different possible digits and symbols; see the notes for each command.

Table 3
AT commands (Part 1 of 3)

Command	Meaning	Notes
ATA	Answer incoming data call	If MCU/MCA is set for manual answer in S registers.
ATDnnnn	Dial	
A/	Repeat last command	Carriage return not required.
ATO	On-line	To go off line, type three escape characters in quick succession.
ATDPnnnn	Voice call	Maximum 32 digits. Available only with MCA.
ATF3	Handsfree/mute	Toggle between mute and normal. Available only with MCA.
ATF4	Voice call on hold	Available only with MCA.
ATF5	Select (voice call off hold)	Available only with MCA.

Table 3
AT commands (Part 2 of 3)

Command	Meaning	Notes
ATH0	Hang up data call when MCU/MCA is off-line	Must first be off-line. To go off line, type three escape characters in quick succession. Return to on-line mode by entering ATO.
ATHP	Hang up voice call	Available only with MCA.
ATIn	Product ID code	If n=0, sends Smartmodem ID (default 960; can also be 122 or 240). If n=1, sends result code '206. If n=4, sends result codes 'a037800C004420' and 'b100000000.' (These are the same values returned by the Smartmodem V-series 9600.)
ATQn	Result code	If n=0, results codes are sent. If n=1, no result codes are sent. The result codes are: 0: ok; command was successful 1: connect; far end answered 2: ring; local end is ringing 3: no carrier; call was released 4: error; command line contains error 5: connect 1200 7: busy; busy signal detected 10: connect 2400 11: connect 4800 12: connect 9600 14: connect 19200
ATVn	Verbal result	If n=0, number codes are sent. If n=1, no numeric codes are sent. See ATQn for result codes.
ATXn	Result code selection	If n=1, supports result codes 0–4. If n=1 or 2 supports all result codes except 7. If n=3 or 4 supports all result codes. See ATQn for result codes.
ATSn?	Reads the value of S register n	See "Reading and writing to S registers" on page 52.
ATSn=xxx	Writes xxx to S register n	See "Reading and writing to S registers" on page 52.

Table 3
AT commands (Part 3 of 3)

Command	Meaning	Notes
ATZ	Soft reset to default parameters	Returns registers S0 through S49 and AT configurations to default settings.
ATCn	Carrier detect	If n=1, carrier detect is enabled. If n=0, it is disabled.
ATEn	Echo	If n=1, command echo back to terminal. If n=0, there is no echo.
ATTSP!	Transparent mode	Displays raw signaling messages between PBX and the Meridian Modular Telephone (not available with MCU).
AT&Cn	Carrier detect control	If n=1, carrier detect is asserted. If n=0, it is not asserted.
AT&Dn	DTR response	When DTR status changes and n=0, ignore. If n=1, go off-line. If n=2, release the call. If n=3, release the call and return Hayes parameters to default.
AT&Rn	Clear-to-send	If n=1, CTS is always present. If n=0 it is not always present.
AT&Sn	Data set ready	If n=0, DSR is always present. If n=1, it is not always present.
AT&F	Soft reset to default parameters	Returns registers S0 through S49 and AT configuration to default settings.
AT&Y	Soft reset to default parameters	Returns registers S0 through S49 and AT configuration to default settings.

Dialing modifiers

The following rules apply to calling telephone numbers:

— Use digits 0–9 and * and # for placing calls.

— To instruct the system to begin dialing the digits entered, press #.

— To outpulse a tone, press *.

— Delay processing by pressing a comma (time delay is set in S8 register).

— Return to command state after dialing by using a semicolon.

Procedure 42
Reading and writing to S registers

The S registers configure the MCU/MCA. Table 4 shows the S register values.

To read an S register:

— Type ATSn?

where n is the register number.

To write to an S register

— Type ATSn=x

where x is the new value for the S register:

Table 4
S register values (Part 1 of 3)

Register	Definition	Notes
S0	Number of rings incoming, range 0–255	Disable auto answer by setting n=0. Set to other value to indicate number of rings before call answer.
S1	Ring count	This is a read-only register that stores current number of rings for incoming data calls.
S2	Escape character, range 0–255	ASCII value of escape character. If set to a value of 128 or greater, escape character is disabled. The default is 43.

Table 4
S register values (Part 2 of 3)

Register	Definition	Notes
S3	Carriage return character, range 0–127	ASCII value of carriage return used for command line termination and prompt termination. The default is 13.
S4	Line feed character, range 0–127	ASCII value of line feed character; default is 10.
S5	Backspace character, range 0–32, 127	Holds two values for backspace, one for the backspace key, one for the character echoed to move the cursor back. The default is 8.
S6	Wait time before blind typing	Not applicable.
S7	Wait time for carrier/dial tone; range 1–255	Holds Carrier detect timeout value; when time in seconds elapses; call is released. Default is 30 seconds.
S8	Pause time for comma; range 0–255	A comma delays call dialing by the number of seconds defined in this register. The default is two seconds. Does not apply to voice commands.
S9	Carrier detect response time	Not applicable.
S10	Lost carrier hang up delay	Not applicable.
S11	DTMF tone duration	Not applicable.
S12	Escape code guard time range 0–255	Guard time helps recognize escape sequence, used because different numbers of escape characters have different means. Default is 50 (one second).
S51	Delay until modem pool activation; range 0–255	Each S51 increment represents a .25 seconds delay before outbound modem pool activation. The default is 16 (four seconds). Not altered by software reset (applies to SL100 only).

Table 4
S register values (Part 3 of 3)

Register	Definition	Notes
S52,53,54	Product code response	Contain the product identification code returned in response to ATI command.
S66	AT/KBD autobaud interpretation, 0 or 1	A value of 0 means only Hayes autobaud is possible. A value of 1 permits Hayes and keyboard autobaud dialing.

Handling call variations

There are several situations applying to both NT menu and AT command calling procedures that require special handling: busy phone calls, digital trunk calls, manual smart modem pool calls, and access errors.

Procedure 43
Handling busy calls

When a number is busy, you will receive a BUSY RING AGAIN? (Y/N) or a BUSY, PREVIOUS RING AGAIN ACTIVE, REPLACE? (Y/N) prompt. The second prompt indicates that another Ring Again is active.

— To cause the system to continue calling the number, type **Y** (yes)

Note: The ring again feature is available for local calls and for queuing on trunk calls.

— To release the call, type **N** (no).

Procedure 44
Making digital trunk calls

Digital trunks provide additional, optional features: authorization code, expensive route warning, and off hook queuing.

— If an authorization code is required, you are prompted to enter the code after initiating the call.

— If the system has Least Cost Routing, you can choose whether to take the expensive route or to queue for the next available trunk.

— If the system has Off Hook Queuing, you may be asked to wait for a free trunk.

Procedure 45
Manual smart modem pool calls

To make a manual smart modem pool call:

1 Call the local modem.

The following message appears:

CALL CONNECTED. SESSION STARTS.

2 Follow the steps for making a call for your particular smart modem.

For example: ATDT5551212.

The remote modem responds with a **CONNECT** message, and the remote host requests the login sequence.

Dealing with access errors

If you are calling a local modem, you can experience one of three access errors: no answer, modem busy, or illegal number.

— If there is no answer, disconnect the call.

— If the modem is busy, refer to "Handling busy calls" on page 54

— If the number called is invalid, the message NOT IN SERVICE appears and the system releases the call.

If you are calling a remote modem can encounter several difficulties after entering the remote number.

— If you misdial or do not complete dialing within the timeout period (usually 30 seconds) the call is released.

— If the remote modem does not respond properly within the resource block timeout (typically 120 seconds) the call is released.

— If the trunk is busy, out of service, or restricted, you receive a NOT IN SERVICE message and the call is released.

Data adapter device

The Meridian Data adapter device, A64, is a 44 pin, 5 volt CMOS device that interfaces with the A44 and the 80C31 microprocessor, providing serial/parallel and parallel/serial conversions as well as reset and clock monitoring circuitry. Timer/counter circuitry regulates synchronous data operation.

Microprocessors

The Signetics 80C31 microprocessor operates at 20 MHz to take advantage of additional real time. It controls MCU/MCA data functions, interfacing with the A64, a set of EIA drivers and receivers, USART, and memory and handling call requests and other protocols.

In the primary channel, a Mitsubishi M50747 microprocessor initializes the A44 and interfaces to the display. The M50747 also performs key scanning and updates the LCD (MCU only).

RS-232 and V.35 drivers

The MCU/MCA uses CMOS 14506A transceivers for RS-232 drivers and receivers. The V.35 interface uses CMOS 34C86 and 34C87 drivers and receivers.

Power

A universal isolated power supply provides +5 volts, +12 volts, and –12 volts to the MCU through a connector on the daughter board. The MCU does not require internal power conversion.

8530 communications controller (MCU only)

The 8530 communications controller performs the same functions as the 2661 USART and provides High-level Data Link Control (HDLC) control to implement Meridian Packet Handler (MPH).

Digital to Analog converters (MCU only)

The 8-bit Digital to Analog converters generate call progress tones for both MCU channels. The 80C31 microprocessors convert the call progress tones and channel them through the communications controller to the Digital to Analog converters.

Memory

Two 64 K ROMs (the main ROM and the language ROM) and one 8 K static RAM reside on each MCA and MCU board.

MCA memory configuration

The main ROM holds the MCA base code (48.5 K) and the English prompts and the Norwegian language prompts (12.5 K). The language ROM holds the Parisian and Quebec French, Spanish, Italian, and Norwegian screen prompts (51 K). The script feature consumes 1.7 K per language.

4 K of the available 8 K static RAM is currently used.

MCU memory configuration

Since the MCU does not support VCO and script features, the English language resides on the language ROM, where there is more space, instead of on the main ROM. As a result, the main ROM has the base code, including the MPH feature (48 K), and the Norwegian language prompts (2 K). Approximately 14 K is available for future development.

The language ROM holds the Parisian and Quebec French, Spanish, German, English, and Norwegian screen prompts (50 K).

5.2 K of the 8 K static RAM is currently used.

MCU/MCA Performance

The MCU/MCA by itself corrupts less than one in 10E9 bits. The corruption rate between the MCU/MCA and another data module connected through the Meridian 1 is less than one in 10E7 bits.

Real time analysis

The worst case requires a total of 95 microseconds of the 125 microseconds available at 20Mhz.

DTE/DCE configurations

The MCU/MCA can connect to a terminal, printer, computer port, fax, video equipment, and other peripherals. MPH requires the DTE interface (MCU only).

Software

For MPH, MCU requires X11 release 19 software or later. Most non MPH applications can use the MCU/MCA with X11 release 14 software or later. To use the PSDS feature, the system must be running X11 release 16 or later.

Operating parameters

The data parameters are stored locally although the configuration is set in the Meridian 1 system.

With X11 release 18 and later, set system parameters using LD 11 or the keypad. (See the *X11 Administration (553-3001-311)* for prompt and response details.)

Terminal communication

The MCU/MCA communicates with Data Terminal Equipment (DTE) using the operating parameters shown in the table below.

Table 5
Operating parameters

Synchronization	Asynchronous	Synchronous
Number of Bits	8 bits	6,7,8
Parity	none (unchecked)	Not applicable.
Data rate	110, 150, 300, 1200, 2400, 4800, 9600,19200 bits per second (auto-baud)	1200, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 38400, 40800, 48000, 56000, and 64000 bits per second
Stop bits	2 stop bits for 110 bits per second; 1 bit for all other speeds	Not applicable.
Transmission	Full duplex	Full or half duplex.

Note: The MCA with the new redesigned footstand, no longer requires an additional power supply board. If you have a phone set with the footstand manufactured before 1997 you will need an additional power supply board or the redesigned footstand MCA kit. See "Specifications" on page 61. for power requirements information.

Figure 2 shows the back of an Meridian Modular Telephone with an MCA mounted. Figure 3 shows a block diagram of the telephone and MCA.

Figure 2
Back of Meridian Modular Telephone showing MCA

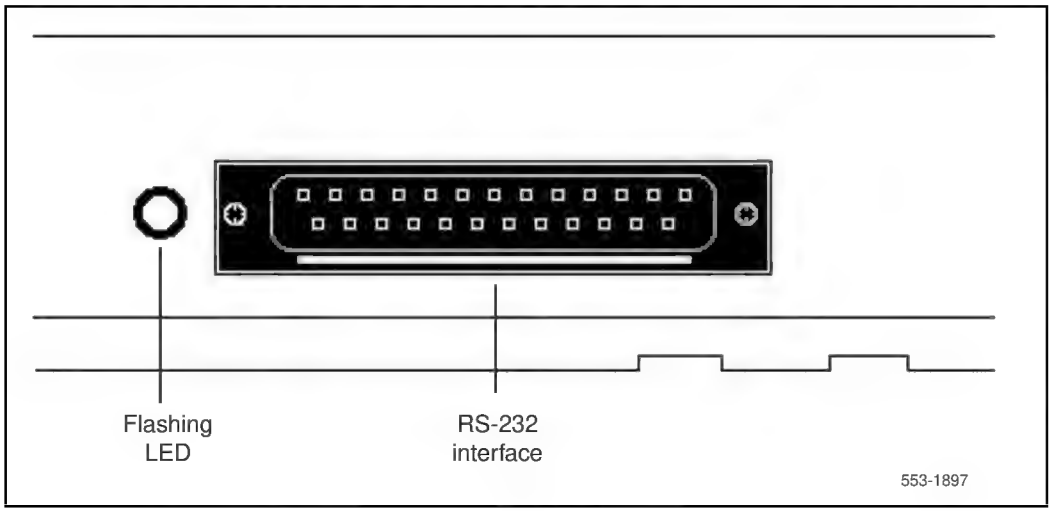
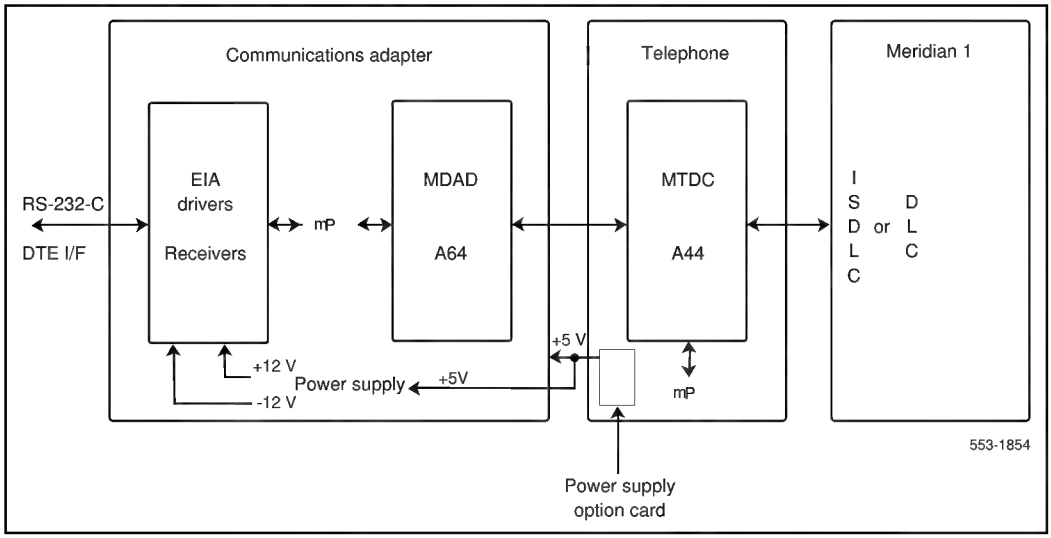


Figure 3
Block diagram of MCA and Meridian Modular Telephone



Specifications

Reference list

The following are the references in this section:

- *Telephone and Attendant Console Installation (553-3001-215)*

This chapter outlines the specifications for the MCU and the MCA.

MCU/MCA parameters

The MCU/MCA can communicate with an ISDLC/XDLC over a distance of 3500 feet using 24-gauge D-type inside cable, with an RS-232 DTE over a maximum distance of 50 feet (with speed up to 20,000 bps), and with a V.35 DTE over 4000 feet at 64 Kbps.

It operates at temperatures between zero and 40 degrees centigrade.

RS-232 interface

Optional jumper plugs on the MCU/MCA board help establish the RS-232 interface. The MCU/MCA meets the EIA RS-232C standards for DTE/DCE interfaces. The electrical characteristics of the interface to the ISDLC/XDLC are the same as for the Meridian Modular Telephones.

V.35 interface

The MCU/MCA has a DB25 connector that provides a V.35 interface to V.35 data terminals, conforming electrically to the CCITT V.35 standard and mechanically to ISO-2110. A DB25-V.35 cable connects a V.35 DTE to the MCU/MCA. For jumper settings, see Figure 5 in "Installation and maintenance" on page 71.

In MPH mode, the MCU must be configured as a DTE. For non-MPH applications, the MCU acts like a DCE. For jumper settings, see Figure 6 in "Installation and maintenance" on page 71.

V.25 bis automatic calling

Synchronous data terminal equipment can originate or answer data calls automatically using this feature. V.25 bis can operate in one of two modes:

1 Direct call and/or answer controlled by DTE. Automatically originates or answers a call by raising the DTE DTR control lead.

2 Addressed call and/or answer authorized by DTE. DTE can instruct the DCE on procedures for originating and answering calls. The MCU/MCA uses nine interchange circuits on the RS-232 or V.35 interface as shown below in Table 6.

Table 6
Interchange circuits

Transmit data	TXD	103	Pin 2
Receive data	RXD	104	Pin 3
Clear to send	CTS	105	Pin 5
Data set ready	DSR	107	Pin 6
Data terminal ready	DTR	108	Pin 20
Ext Tx signal timing		113	Pin 24
Trans signal timing		114	Pin 15
Rec signal timing		115	Pin 17
Ring indicator	RI	125	Pin 22

Video and group four FAX are examples of applications which require the synchronous transmission format that MCU/MCA provides for V.25 bis calling. The video or FAX equipment must ensure that each frame is processed before a new frame is sent.

MCU/MCA supports both the byte-oriented Bisync and the bit-oriented HDLC types of V.25 bis automatic calling protocol.

For synchronous byte-oriented operation, the three-character V.25 commands are encoded in sync format. The frame message field, of variable length, contains the control or command encoded in IA5 characters, each of which includes a 7-bit code and an odd parity bit.

The message exchange between the MCU/MCA and DTE is asynchronous and balanced. MCU/MCA responds to DTE with an indication or a DSR assertion. MCU/MCA issues an invalid indicator and/or does not assert DSR lead if it detects an erroneous frame start or other problem.

MCU/MCA in V.25 bis mode supports these commands for both Bisync and HDLC protocols:

— CRN: call request with number provided. DTE sends to MCU/MCA to initiate call.

— CIC: connect incoming call. DTE instructs MCU/MCA to answer a call.

— INC: incoming call indication. MCU/MCA sends to DTE to signify incoming call detection.

— INV: invalid indication. MCU/MCA has received a DTE command that it does not support, or a valid command followed by invalid parameters.

DTE tells MCU/MCA to respond to a CRN or CIC command. If the receiving unit is busy or out of order, DTE receives no indication and drops DTR to release the call after thirty seconds.

Telephone interface

The MCU connection to the ISDLC or XDLC uses a six-position jack mounted on the rear of the housing at the position labeled "line." The MCA is connected to the Meridian Modular Telephone.

A five conductor cord connects the main assembly of the MCU to the power supply, which is external to the MCU. The MCA installed in a phone set with a date code prior to January 1998 requires the installation of power supply board. In January 1998 the MCA is available with a redesigned footstand that eliminates the need for a power supply board.

Synchronous mode

In Synchronous mode, the MCU/MCA transmits data at 1200, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 38400, 40800, 48000, 56000 (the default) or 64000 bits per seconds.

Asynchronous mode

In Asynchronous mode, the MCU/MCA transmits data at 110, 150, 300, 600, 1200, 2400, 4800, 9600 (default), or 19200 bits per second. After start up, speeds and parity are then determined by an autobauding and autoparity routine in the firmware.

MCU power supply

An external power supply is supplied with the MCU.

An optional 220 V/50 Hz powered MCU is available (A0318291) for the international market. For MCU power requirements, see "Power requirements" on page 69.

MCA power supply

When installing an MCA to an NTZK or NT2K phone set with date code prior to January 1998 it requires a Power Option board and a power source.

When installing an MCA in an NT9K phone set or an NT2K with date code of January 1998 you will only install the MCA (an additional Power Option board is not required). For detailed power requirements, refer to *Telephone and Attendant Console Installation (553-3001-215)*.

EIA RS-232 leads

Table 7 shows the EIA leads supported by the MCU/MCA.

Table 7
EIA signals supported by MCU/MCA (Part 1 of 2)

Circuit number		MCU/MCA DB-25	Signal source		Abbrev.	Description
EIA	CCITT	Pin No.	DTE	MCU/MCA (DCE)		
AA	101	1				Protective Ground *
BA	103	2	X		SD	Transmitted Data
BB	104	3		X	RD	Received Data
CA	105	4	X		RTS	Request to Send
CB	106	5		X	CTS	Clear to Send
CC	107	6		X	DSR	Data Set Ready
AB	102	7		X		Signal Ground
CF	109	8		X	CD	Carrier Detect
		9/10				no connection
SBA	118	11	X			Sec. Trans Data*
SBB	119	12		X		Sec. Rec. Data*
		13/14				no connection
DB	113	15		X	SCT	Transmitted Data Clock

Table 7
EIA signals supported by MCU/MCA (Part 2 of 2)

Circuit number		MCU/MCA DB-25	Signal source		Abbrev.	Description
EIA	CCITT	Pin No.	DTE	MCU/MCA (DCE)		
		16				no connection
DD	128	17		X	SCR	Received Data Clock
		18/19				no connection
CD	108.2	20	X		DTR	Data Terminal Ready
		21				no connection
CE	125	22		X	RI	Ring Indicator
CH/CI	126	23	X			Data Rate Select
DA		24	X			External Transmit Clock
BO		25	X			Busy Out **

*These signals are only supported by the MCA secondary channel for VCO and transparent mode commands.

** Pin 25 is connected to an RS-232 receiver on the MCU/MCA, but is ignored by the MCU/MCA controller

CCITT V.35 leads

— Table 8 shows the V.35 (CCITT) leads supported by the MCU/MCA. An adapter cable is needed to convert the ISO 2110 (DB-25) into an ISO 2593 (34-pin cable)

— For DTE equipped with female ISO-2593, Adapter cable number A0408928* is required.

— For DTE equipped with male ISO-2593, Adapter cable number A0408927* is required.

Table 8
V.35 CCITT signals supported by MCU/MCA (Part 1 of 2)

V.35 CCITT	MCU/MCA DB-25 Pin No.	Abbrev	Adapter cable		Signal Source		Description
			DB-25 Pin No.	V.35 Pin No	DTE	MCU/MCA (DCE)	
101	1	DG	1	A			Protective Ground
103A	2	SDA	2	P	X		Transmit Data A
104A	3	RDA	3	R		X	Receive Data A
105	4	RTS	4	C	X		Request to Send
106	5	CTS	5	D		X	Clear to Send
107	6	DSR	6	E		X	Data Set Ready
102	7	S	7	B			Signal Ground
109	8	CD	8	F		X	Carrier Detect
—	9/10	—	9/10	CC/L			no connection
—	11	—	11	K	X		*
115B	12	SCRB	12	X		X	Serial Clock Receive B
103B	13	SDB	13	S	X		Transmit Data B

Table 8
V.35 CCITT signals supported by MCU/MCA (Part 2 of 2)

V.35 CCITT	MCU/MCA DB-25 Pin No.	Abbrev	Adapter cable		Signal Source		Description
			DB-25 Pin No.	V.35 Pin No	DTE	MCU/MCA (DCE)	
114B	14	SCTB	14	AA		X	Serial Clock Transmit B
114A	15	SCTA	15	Y		X	Serial Clock Transmit A
104B	16	RDB	16	T		X	Receive Data B
115A	17	SCRA	17	V		X	Serial Clock Receive A
—	18	—	18	M	X		Sec Trans Data**
	19		19	HH			no connection
108.2	20	DTR	20	H	X		Data Terminal Ready
—	21	—	21	EE		X	Sec Rec Data**
125	22	RI	22	J		X	Ring Indicator
113B	23	SCTEB	23	W	X		Tran Sign Elemt Time B
113A	24	SCTEA	24	U	X		Tran Sign Elemt Time A
—	25	—	25	MM	X		*

* These leads are ignored by the MCU/MCA controller.

** These signals are only supported by the MCA secondary channel for VCD and transparent mode commands.

Note: The A0300752 or A0300753 cables are still supported unless used with applications similar to IBM front end.

The MCU/MCA may be placed as far from its associated data terminal or computer port as is consistent with EIA RS-232 or V.35 lead specifications.

Power requirements

The MCU is powered from an external power supply. The MCA for the international market is powered by the Meridian Digital Telephone. The MCA for the North American phone sets with date code prior to 1998 are powered by an optional power supply source installed within the telephone set. If you have an NT9K or NTZK phone set with a date code of January 1998 or later, you do not need a power option board to operate the MCA. For detailed power requirements, refer to *Telephone and Attendant Console Installation (553-3001-215)*. The MCU power requirements are as follows:

Voltage	Tolerance	Current	
		Nominal	Maximum
+5 V dc	±5%	0.8 amp	1.0 amp
+12 V dc	±10%	85 mA	0.2 amp
–12 V dc	±10%	35 mA	0.2 amp

A total of 1.0 ampere is required from the 110 V ac power receptacle.

Environmental

The MCU/MCA should not be operated in an environment conducive to corrosion, discoloration, brittleness, electrical performance degradation, or safety-endangering malfunctions due to environmental stresses. It will operate properly and safely in an operating temperature range of 0 to 50 C, with humidity between 5 and 85%, low air pressure of 600 mbar, vibration of 5–200 Hz, and RFI susceptibility of five V/M. The unit should survive a drop of 75 cm without damage.

Reliability

The mean time between failure is ten years at a 25 C operating temperature, with a mean time of 15 minutes to diagnose and repair. Field replaceable parts include the line cord (equipped with Teledapt connectors), key caps, labels, external power supply, and display.

MCU/MCA protocols and functional support

MCU/MCA supports the T-Link and DM-DM protocols and facilitates PSDS as described below:

— T-Link, NT's proprietary protocol for transferring either asynchronous or synchronous data over a 64 Kbps digital circuit used by SL-100/DMS 100 data devices.

— DM-DM, an NT proprietary protocol used by Meridian 1 data services.

— PSDS, Public Switched Data Services, help establish a connection between a Meridian 1 and a Central Office or another vendor's PSDS compatible switch.

Protocol adaptation process

Protocol adaptation is transparent to the user.

Internal calls are completed using the DM-DM protocol, except for calls to or from a BRI set (M5317) which will be completed using the T-Link protocol.

External calls must use either the DTI or PRI card. The MCU/MCA steps through each of the protocols that it supports and attempts to make a connection or complete the protocol exchange. If none of the protocols lead to a connection or protocol exchange, the call is released. The first protocol tried is based upon the protocol selection system parameter entered in LD 11. The PSDS protocol is tried as the last protocol if MCU/MCA is configured for synchronous transmission. The MCU/MCA takes about two seconds to go into T-link mode (if DM-DM is not successful), and about 20 seconds to go into PSDS mode (if T-Link handshake is not successful). After the call is released, the originating MCU/MCA reverts back to the original protocol selected by the PSEL parameter in LD 11.

Installation and maintenance

Reference list

The following are the references in this section:

- *Meridian 1 Telephones Description and Specifications (553-3001-108)*
- *X11 Administration (553-3001-311)*
- *Meridian Communications Adaptor user guide* (P0744323)

This chapter describes the installation, maintenance, and removal techniques for the MCU/MCA. The final section of the chapter gives troubleshooting advice.

Configuring the V.35

The MCU/MCA is shipped from the factory configured for the RS-232 interface. Configure V.35 in the field at installation time. You must install jumper plugs in either RS-232 or V.35 mode.

To configure the MCA/MCU in V.35 mode, ensure that the subsequent steps are followed:

1 Ensure that the MCA/MCU has the jumper plugs in the RS232 mode as shown in Figure 5

2 Power up the MCU*

3 Connect MCA/MCU to the wall jack.

4 Press P¤/ to select SYNCHRONOUS MODE.

5 Press P¤¤ to select synchronous BAUD RATE.

6 Disconnect MCA/MCU from the wall jack.

7 Power down the MCU*

8 Move jumpers from RS232 sockets to the V.35 sockets as shown in Figure 5.

*This step applies to the MCU only.

V.35 and MCA

The V.35 interface can be selected with two DIP jumpers. The V.35 signals appear on the DB-25 connector; an adapter cable is required. The MCA can be placed as far from its associated data terminal or computer port as is consistent with EIA RS-232 or V.35. Jumper plugs on the MCA card may be moved from RS-232 to V.35.

V.35 and MCU

For V.35 interface configuration, remove a 10-pin DIP jumper plug from the MCU RS-232C sockets and install it in the V.35 socket. These sockets are located on the **daughter** board inside the MCU as shown in Figure 5.

Figure 4
MCU daughterboard

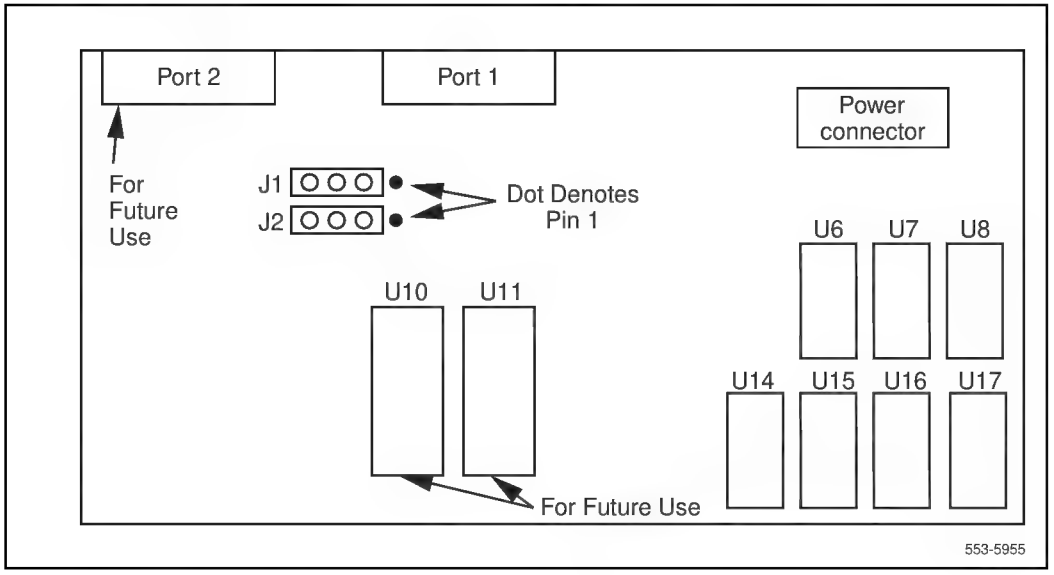


Figure 5
MCU V.35/RS-232 jumper locations

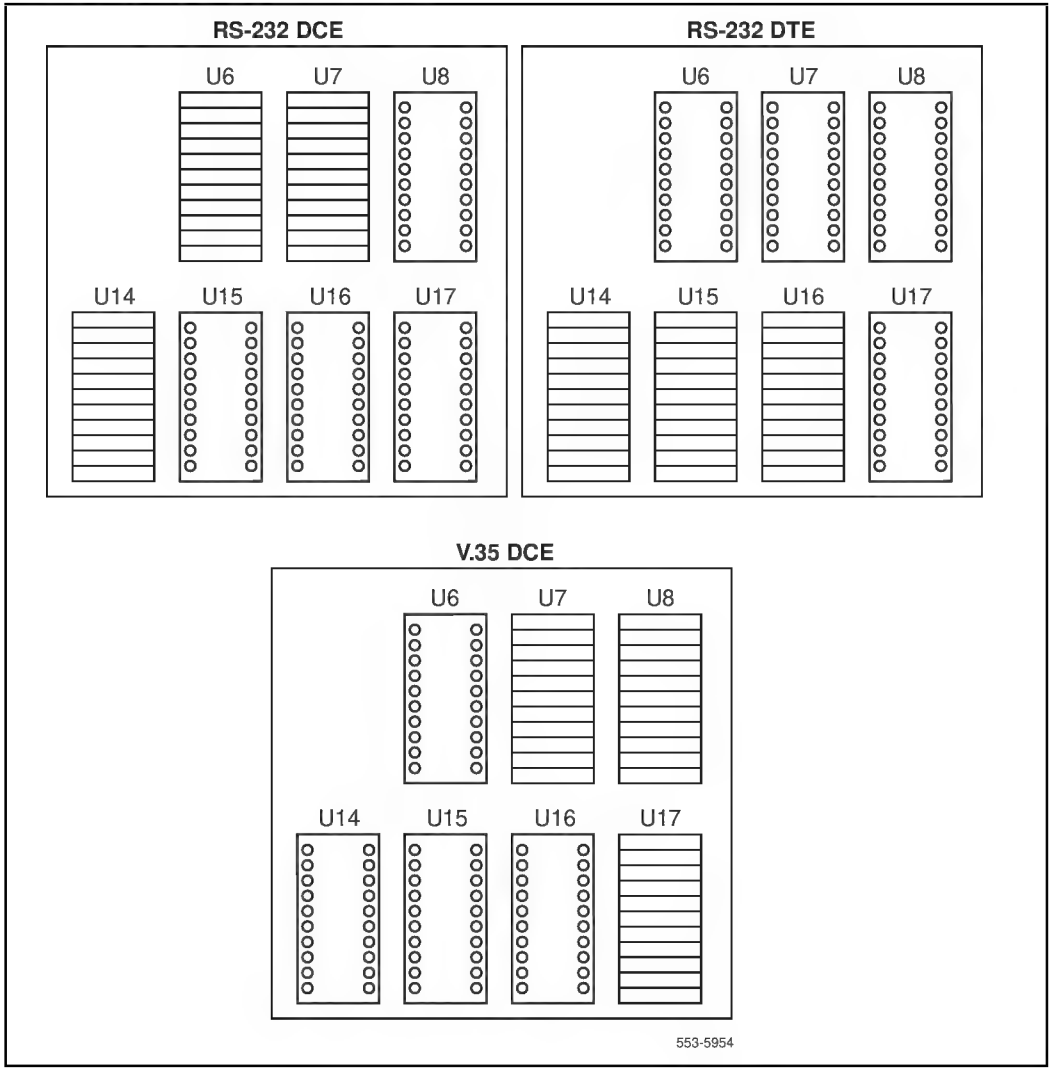
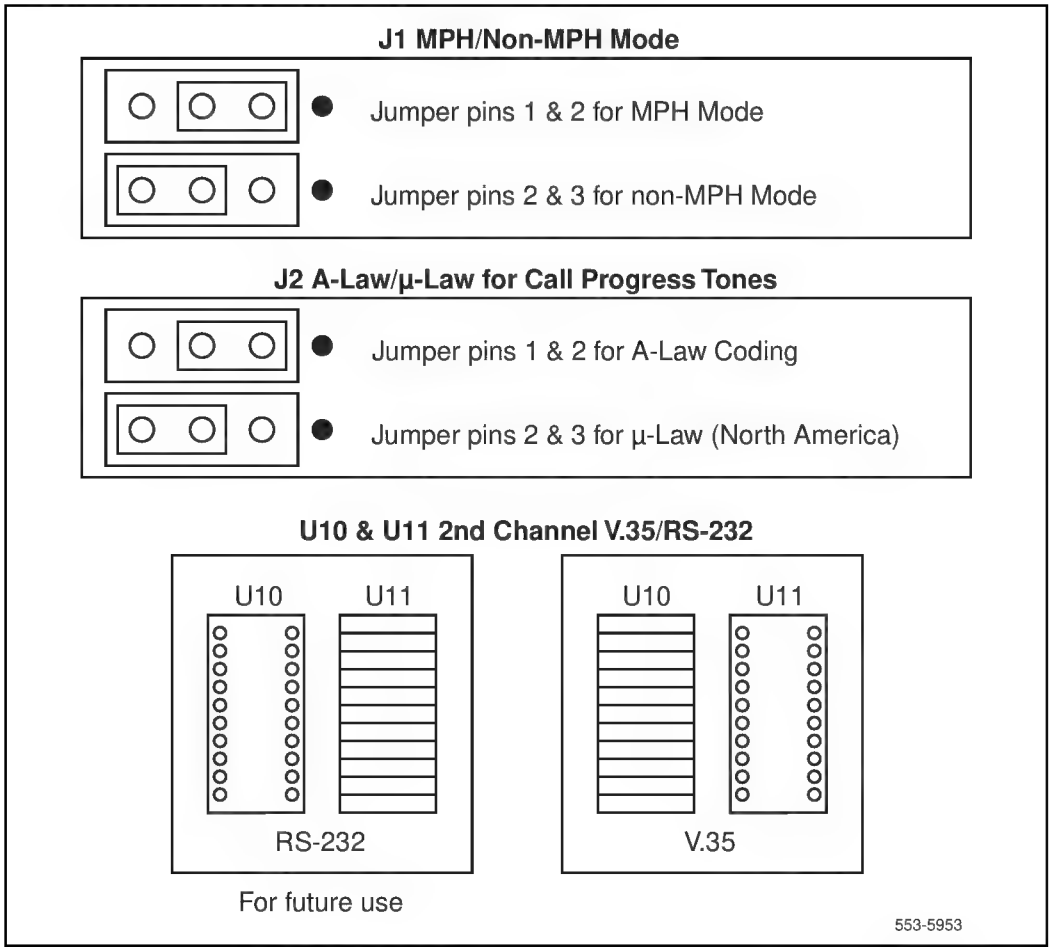


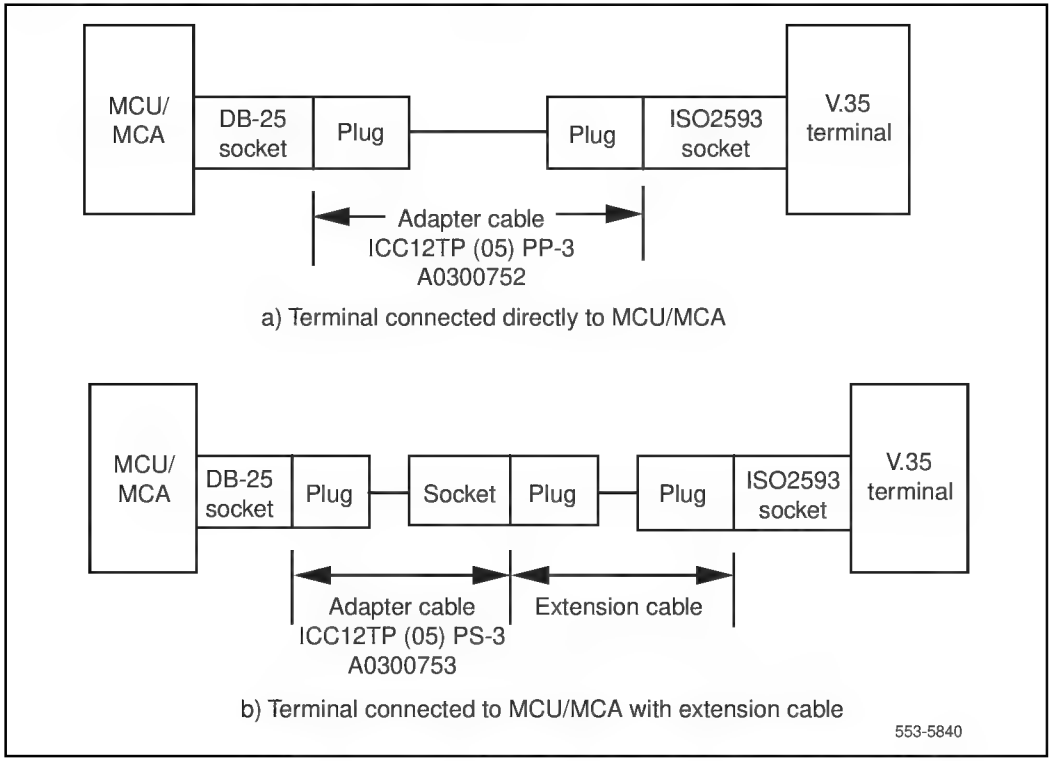
Figure 6
MPH/non-MPH and A-law/µ-law jumper locations



Adapter cable

An adapter cable converts the ISO-2110 connector into an ISO-2593 (34-pin connector) as shown in Figure 7.

Figure 7
MCU/MCA with adapter cable connection for V.35



For a DTE equipped with female ISO-2593, Adapter cable number A0408928* is required.

For a DTE equipped with male ISO-2593, Adapter cable number A0408927* is required.

Note: The A0300752 or A0300753 cables are still supported unless used with applications similar to IBM front end.

Cabling

The physical capacities and provisioning requirements of data feature hardware must be met upon installation. Table 9 lists cabling and environmental requirement and limitations. No special installation tools are needed.

Table 9
Cabling capabilities

Allowable cabling	Type D PVC inside wiring cable		
	PIC for outside use only		
Maximum separation distances			
MCU/MCA to DTE	Distance consistent with EIA RS-232 cable loading specifications.		
	Note that in some cases the above limitations may be exceeded with no adverse effect on MCU/MCA operation.		
Distance (by cable type)			
MCU/MCA to DLC	PIC outside	PVC inside	Gauge
	4000 ft. (1220 m)	4000 ft. (1219 m)	22 AWG
	3500 ft. (1070 m)	2900 ft. (884 m)	24 AWG
	2000 ft. (610 m)		26 AWG
	2500 ft. (760 m)	2500 ft. (760 m)	22/24 mixed
	1500 ft. (460 m)	1200 ft. (370 m)	24/26 mixed

DTE interface

The MCU/MCA provides a 25-pin connector (that conforms to ISO-2110) that mounted in the rear on the housing.

If an RS-232C cable connects the MCU/MCA to an ADM3 terminal, disconnect pin 22. (The ADM3 enters test mode if pin 22 remains connected.)

When the MCU/MCA is connected to a VT100 terminal, a break on the terminal drops DTR. The MCU/MCA does not display the released message. Display the prompt by forcing DTR on the MCU/MCA.

When the MCU/MCA is connected to a VT102 terminal, a break on the terminal drops DTR. The MCU/MCA does not display the released message.

No data should be sent to MCU/MCA when the MCU/MCA is idle, in the asynchronous mode (when there is no active call). The user must stop the data flow from the DTE before connecting it to the MCU/MCA.

Configuration

Hardware provisioning capacities follow:

Item	Comments
MCU/MCA	Each MCU/MCA is connected to a data port of an ISDLC/XDLC
MCU/MCA terminating on ISDLC/XDLC	No voice TN with MCU. Refer to LD 11.

Field-replaceable items

The table below lists items that can be replaced in the field.

The related hardware is installed in different basic configurations with equipment allocated as follows:

1	MCU includes power supply (NTND36AA) or MCA (NT2K65XH)
1	QPC578 or NT8D02 port
1	NE 25MQA2A (A0237451) RS-232 cable (MCU–DTE)
1	NPS 50220-03L5 (A0336823) power supply
1	NPS50318 wall jack, 7 ft (2 m) A0346862

Note: If the MCU is specifically configured for V.35 interface, an adapter cable is needed (see Figure 7).

1	Plug to plug adapter cable ICC12TP (05) PP-3, 5 ft. (1.5 m), A0408928. V.35 male to male adapter cable.
1	Plug to socket adapter cable ICC12TP (05) PS-3, 5 ft. (1.5 m), A0408927. V.35 male to female adapter cable.

The Meridian 1 recognizes the MCU/MCA port as a Meridian Modular Telephone. Enter data hardware information into memory using LD 11.

Note: The A0300752 or A0300753 cables are still supported unless used with applications similar to IBM front end.

MCU/MCA LD 11 administration summary

Table 10 describes the LD 11 prompts used for configuring an MCU/MCA in non-MPH mode.

Table 10
Prompts for configuring MCU/MCA in non-MPH modeuits

Prompt	Response	Description
REQ:	NEW, CHG	
TYPE:		Type of data block
	MCA	Meridian Communications Adapter
	MCU	Meridian Communications Unit
MPHI	NO	(MCU only) respond NO for non-MPH
CLS	DTA	Used to select a data terminal.
TOV		Inactivity timeout
	(0)	No timeout
	1	15 minutes
	2	30 minutes
	3	60 minutes
DTAO	MPDA, MCA	Data option. Prompt does not appear for an MCU.
		MPDA: MCU/MCA always uses DM-DM protocol. Protocol conversion to and from T-Link is always performed by the protocol converter which resides on the DTI or PRI card. PSDS can only be used if both ends are specifically configured for PSDS mode (no protocol step through).
		MCA: MCU/MCA is capable of using DM-DM or T-Link protocols. The protocol converter on the DTI or the PRI card is turned off and MCU/MCA performs the conversion. Timed protocol step through to PSDS is also operative. If the called or the calling side is in PSDS mode, the other side will automatically step through to PSDS mode.
PSEL	DMDM, TLINK	Protocol selection. Sets the primary protocol to be used by MCU/MCA. Does not appear if DTAO=MPDA.
OPE	YES/(NO)	Operating parameter change. For a complete list of the operating parameters, refer to the LD 11 section of the *X11 Administration (553-3001-311).*
KEY	SCR xxxx	DDN
KEY	ADL	Autodial
KEY	RGA	Ring Again
KEY	SCC yyyy	Speed Call
KEY	DSP	Display (MCU only).

Table 11 describes the prompts used for configuring an MCU in MPH mode.

Table 11
Prompts for configuring MCU in MPH mode

Prompt	Response	Description
REQ	NEW, CHG	
TYPE	MCU	Select MCU for MPH operation.
MPHI	YES	Select the MPH option
OPE	YES/(NO)	Consult the MPH requirements for setting up the operating parameters.

Installing and removing the MCU

Installation and removal procedure are provided in detail in Procedures 46 and 47. Disconnect the MCU from the network by disabling the database port with LD 32.

Installation and removal procedures

These procedures require the following materials:

— NTND36AA (MCU) with power supply and line cord to wall jack.

— XDLC/ISDLC port.

The factory sets the MCU in RS-232 mode, non-MPH, and asynchronous.

Note: Always connect the power supply plug to the MCU before connecting it to the wall outlet.

Procedure 46
Installing the MCU

1 Ensure that the MCU is not powered up.

2 Install XDLC in IPE self or ISDLC in EPE shelf.

3 Make the cross-connections and ensure that the pin numbers are correctly connected.

There should be no bridge taps on the line.

4 Designate the cross-connections.

5 Use LD 11 to update system memory for the MCU or the DLC. No voice should be configured for MCU TN.

For detailed information, see *X11 Administration (553-3001-311)*.

Note 1: If the MCU is connected to an ISDLC/XDLC port that is configured as a Meridian Modular telephone with a data option, the MCU may work for several minutes and then misfunction when it receives the first lamp audit message from the switch. To avoid this problem, ensure that no voice TN is configured for the MCU TN.

Note 2: In addition, ensure that the following restrictions are observed.

CLS =	DTA	Data Terminal
CLS =	WTD	Warning Tone Denied
	Key 0	DN
	Key 1	Reserved
	Key 2	Reserved
	Key 3 *	Autodial (optional)
	Key 4	Ring again (optional)
	Key 5	Speed Call (optional)
	Key 6**	Display (DSP) (optional)

* Key 3 is required for autodial or hot line feature.
** DSP requires that class of service be updated to ADD.

6 Plug the power supply connector to the MCU.

7 Plug the power supply into a commercial 110 V ac outlet.

8 Test the MCU by placing a data call.

Procedure 47
Removing the MCU

1 Use overlay 32 to disable the port connected to the MCU.

2 Unplug and disconnect the power supply.

3 Remove the connections from the MCU to the:

switch equipment
DTE

For more information about this step, see Procedure 46, Step 3.

4 Remove the MCU.

5 Pack and ship the equipment.

Installing and removing the MCA

Use the following procedures to add the MCA to the M2006, M2008, M2016S, M2616, and M2216ACD telephones and connect the MCA to your terminal.

CAUTION

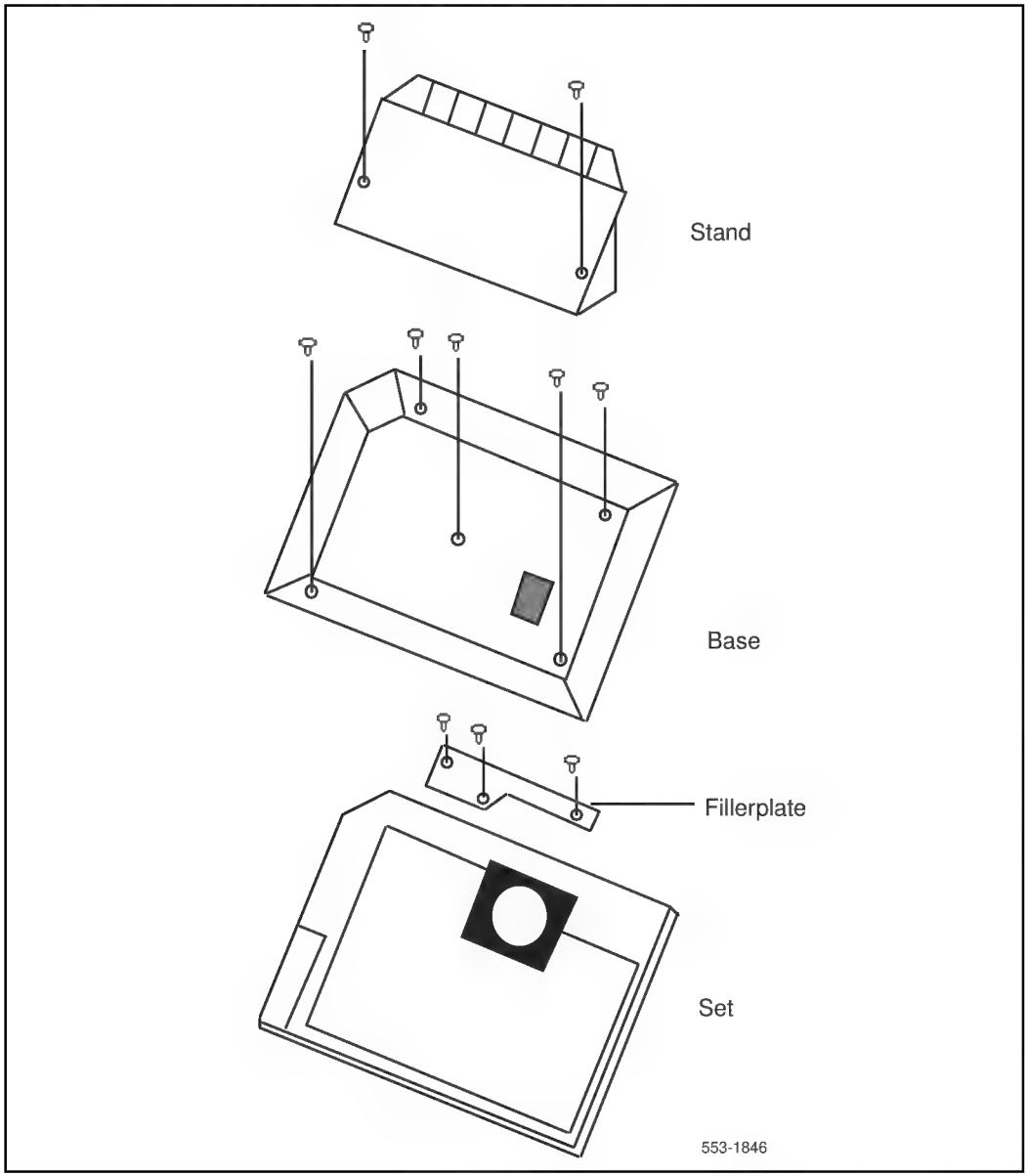
Use only the line cord provided with your Meridian Modular Telephone when installing and removing options. The acceptable line cord is A0346862.

Figure 8 shows an exploded view for reference when dismantling the telephone to get at its internal components. Some telephone types are slightly smaller than the M2616 and do not have the center screw in the base, but otherwise are the same. The center screw may not be required.

Beginning with X11 release 18, data programming can be implemented in the MCA through a service change (LD 11) as well as the keypad. X11 releases 14 through 17 support data commands on the keypad only.

When using the MCA for synchronous data connections, configure the telephone with a display option to view the data parameters.

Figure 8
Exploded view of the M2616/M2016S/M2216ACD telephone



Procedure 48
Installing and removing the Meridian Communications Adapter

> **CAUTION**
> Before handling internal telephone components, you must discharge static electricity from your hands and tools by touching any grounded metal surface or conductor.

If you have a NT9K phone or the NT2K with date code of January 1998 or later you do not need to install a Power Option board to operate the MCA.

1 Remove the handset and place the telephone upside down on top of a level, solid work surface (a desktop, for example) covered with soft material or paper to prevent damage to movable keys and the telephone face.

2 Disconnect all cords from the telephone.

3 Remove the footstand.

- For NT2K and NTZK with date code prior to January 1998 remove the two screws from the footstand assembly and unsnap the footstand by pressing inward at the back of the footstand where it meets the base and pulling upward.
- For NT9K and NT2K with date codes of January 1998 retain the footstand, skip to Procedure 10 on page 85.

4 If the telephone is not equipped with the Meridian Programmable Data Adapter (MPDA) or Meridian Communications Adapter (MCA), go to Procedure 6 on page 85. If you wish to replace an existing MPDA or MCA, carefully disconnect the end of the 8-pin TELADAPT jack plugged into the telephone by pressing firmly on the latch-tab and slowly lifting up.

5 Turn the telephone footstand assembly over and put it in the normal use position. Remove the two self-tapping screws that fasten the MPDA or MCA to the telephone footstand assembly and remove the MPDA or MCA by pulling outward and up. Go to Procedure 11 on page 86 to replace the MPDA or MCA.

Note: To remove the footstand from the base, press in the back edge of the footstand as you lift it from the base.

6 Remove the back covering of the phone base by removing the four screws holding it in place.

7 If the NTZK or the NT2K (with date code prior to January 1998) phone set is equipped with a Power Option board and/or cable, you must remove the Power Option board and/or cable before installing the MCA.

- Remove the two small screws from the Power board (near the top) and set them aside.
- To disconnect the Power Option board from the NTZK telephone, grasp the board firmly on each side and slowly rock the board while applying upward pressure, until it is released from the 2X7 pin connector.
- To disconnect the NT2K Power Option board from the set, simply remove the screws from the base and lift the board out of the set and disconnect and remove the ribbon cable from the 2X7 pin connector.

8 If the phone is equipped with the External Alerter board, you must remove it before installing the MCA with redesigned footstand.

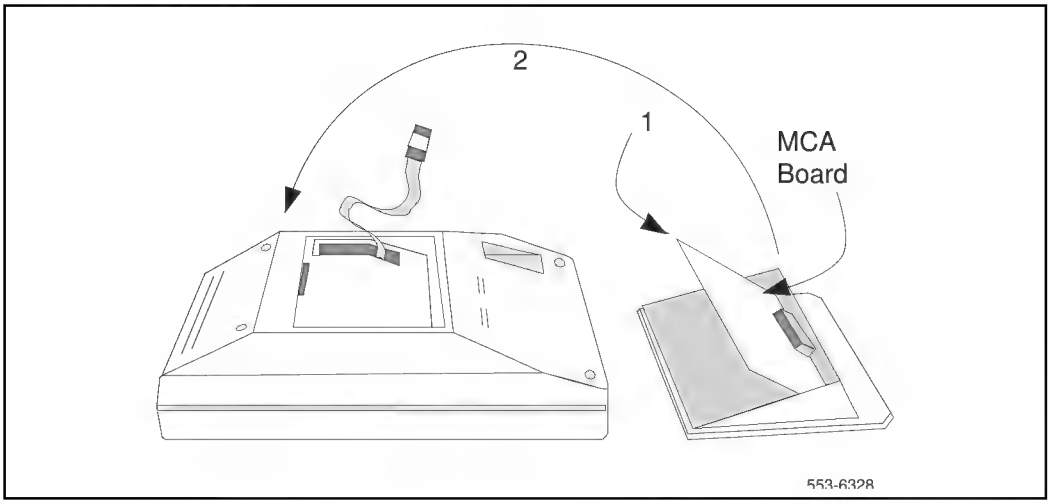
- The External Alerter board is located at the right center of the telephone.
- Remove the screws form the board, grasp the board firmly on each end and pull upward to remove it from the 2X3 pin connector.

9 Install the Jumper board onto the 2X7 pin connector inside the phone base.

- If the phone set did not have a Power Option board installed on the NT2K or the NTZK then there will be 2 Jumper plugs on the 2X7 connector. Remove them before installing the Jumper board.
- The redesigned footstand will have 2 jumpers. Use the black one for the NT2K phone and the brown one for the NTZK phone.

10 Remove the knockout section in the rear of the telephone footstand assembly by using a screwdriver to break plastic tabs holding it in place. After removing knockout clean area of any small fragments of plastic.

Figure 9
Installing the MCA



11 For MCA, set option plugs to the required configuration, RS-232 or V.35. The factory default is RS-232.

12 Tilt the MPDA or MCA circuit board up and insert the DB-25 connector socket into the breakout section.

- Then slide the board connector end-first under the tabs in the footstand assembly and position it over the locating pins.
- Position and lower it completely onto the telephone footstand assembly.
- Insert the two self-tapping Phillips-head screws supplied with the MPDA or MCA into the mounting holes and tighten them with a #1 Phillips screwdriver.

13 Plug one end of an 8-conductor line cord supplied with a TELADAPT adapter in the jack J1 of the MPDA or MCA (latch tab facing down) and plug the other end of the line cord into the data jack in the base of the modular telephone. Make certain the latch tab of each cable end is firmly snapped into place.

- Insert the two self-tapping Phillips-head screws supplied with the MPDA or MCA into the mounting holes and tighten them with a #1 Phillips screwdriver.

14 Carefully route the excess cable so that it will not become pinched between the footstand and base.

15 Reassemble the base and footstand assembly sections, ensuring that the footstand is firmly seated on the base.

16 Tighten the screws,

- Reconnect all cords, including the handset cord and the new wall transformer.
- Place the telephone in the normal operating position.

Note 1: Place the label supplied with the MPDA or MCA on the outside of the bottom cover of the telephone. This allows proper identification and tracking of the option level of the set.

Note 2: If an ADM3, ADM5, or ADM11 terminal is used in conjunction with the DB-25 connector-C interface connector in the Asynchronous Programmable Data Adapter, pin 22 in the DB-25 connector cable must be disconnected. These ADM terminals will go into test mode if this pin is not disconnected.

Procedure 49
Connecting the data terminal

1 Connect the DB-25 connector-C interface connector from the data terminal to the matching header connector in the back of the modular telephone.

2 Insert the two captive screws in the connector body into the threaded holes in the header connector and secure tightly to prevent accidental disconnection during data terminal operation.

Power Supply Board

Note: The Power Supply Board is no longer needed for the installation of the Meridian Communication Adapter (MCA) for phones with date code of January 1998 or later. For phones with a date code prior to January 1998 the MCA gets its power from the optional power supply board, however the MCA can be ordered with the redesigned footstand, eliminating the need for an optional power supply board on the older phone sets.

If you have an existing Power Option board in your phone set, remove it prior to installing the MCA with the redesigned footstand.

Use Procedure 50 to add a Power Supply board to the telephone for connection to a transformer or closet power supply. When installing an MCA or MPDA to NTZK or NT2K phone sets with a date code prior to January 1998, a Power Option board is required along with an additional power source.

When installing an MCA in an NT9K or NT2K phone set with a date code of January 1998 or later, a Power Option board is not required.

> **CAUTION**
> Connect the optional Power Supply to your Meridian Modular Telephone only. Equipment damage may result from incorrect connections. Both the closet power supply and the transformer are for use with the Meridian Modular Telephone only.

Procedure 50
Installing and removing the Power Supply Board

> **CAUTION**
> Before handling internal components of telephones, you must discharge static electricity from your hands and tools by touching any grounded metal surface or conductor.

1 Remove the handset and place the telephone upside down on top of a level, solid work surface (such as a desktop) covered with soft material or paper to prevent damage to movable keys and the telephone face.

2 Disconnect all cords from the telephone.

3 Remove the two screws from the stand assembly and unsnap the stand assembly by pressing inward at the back of the stand where it meets the base and pulling upward.

4 If the telephone is equipped with a Meridian Communications Adapter (MCA), unplug the data cable from telephone's base jack.

5 Remove the screws securing the base of the telephone to the top cover. Remove the base and set it aside.

6 If the telephone is equipped with a display, disconnect the display ribbon cable from the display board and move it out of the way.

7 If the telephone is not equipped with the Power Supply Board, remove the jumpers from P1 connector pins on the Main Board. Go to step 9.

If the telephone is equipped with a Power Supply Board, go to step 8.

8 The Power Supply Board is located on the left side of the telephone. Remove two small screws from the Power Supply Board (near the top) and set them aside. Grasp the board firmly on each side. Work the board loose from the connector by slowly applying upward pressure to alternate sides until released.

If you are not replacing the Power Supply Board, place the jumpers (AO288529) connecting the bottom two sets of pins on the P1 connector.

9 Place the Power Supply Board so that the alignment pin on the telephone fits into Slot A or Slot B (depending on telephone set) on the board (see Figure 10). Align the mounting holes in the board (near the top) over the mounting holes in the telephone and carefully press down so that the H1 connector on the board slides onto the P1 pins.

10 Take the self-tapping Phillips head screws supplied with the Power Supply Board and install them into the mounting holes. Tighten firmly with a #1 Phillips screwdriver.

11 If the telephone has a display, reconnect the display ribbon cable.

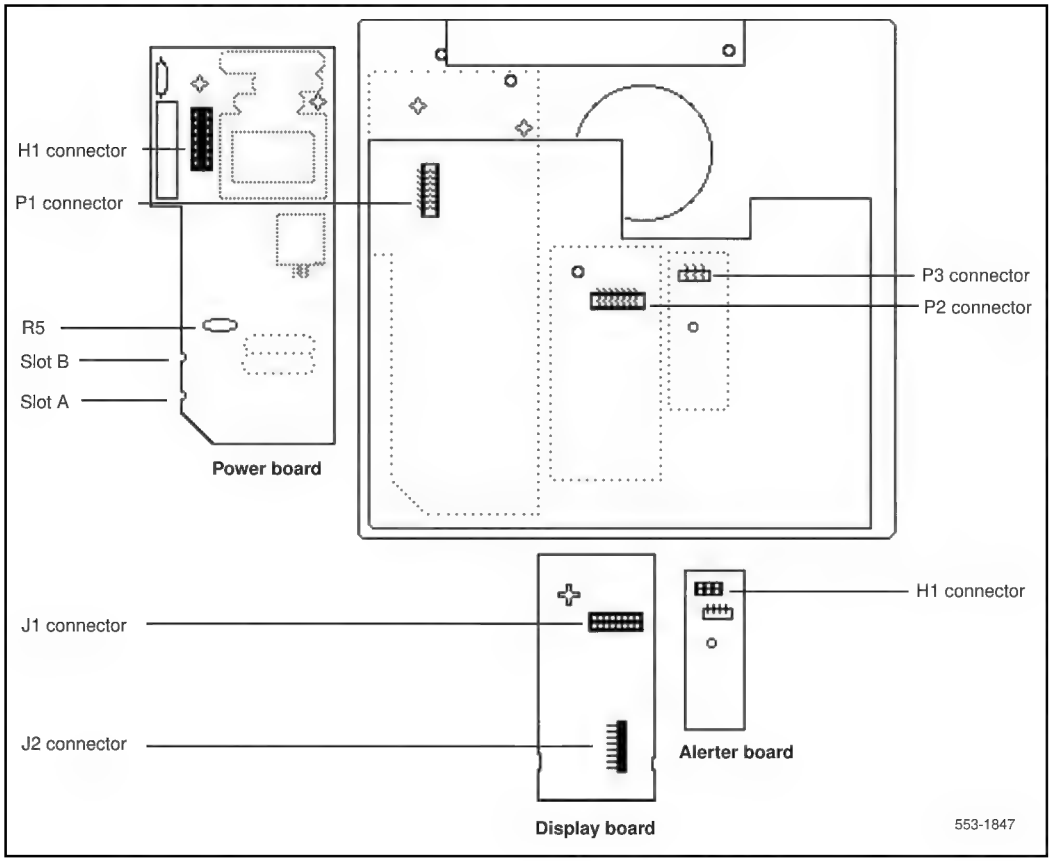
Note: Do not allow R5 on the Power Supply Board to become bent during this procedure.

12 Replace the base. If the telephone is equipped with an MCA, reconnect the data cable to the base telephone jack and replace the stand (ensuring that the MCA cable does not get pinched between the base and stand). Make sure the stand is firmly seated to the base.

13 Tighten all screws, reconnect the line cord, and place the telephone in the normal operating position. Place the label supplied with the Power Supply option on the bottom cover of the telephone for tracking purposes.

14 Connect the telephone to a local transformer or closet power supply as shown. Refer to *Meridian 1 Telephones Description and Specifications (553-3001-108)* for requirements.

Figure 10
M2006/2008 telephone and option boards



Maintenance

Two basic sets of diagnostics address asynchronous and synchronous connections.

Troubleshooting asynchronous problems

Symptom:

The MCU is not responding.

Check that the power supply (MCU) is plugged in.

Symptom:

You cannot make a call.

Operate the FORCE DTR key on the MCU and verify that the DTR LCD in the Program Key command 63 screen is on.

Symptom:

The LED stays on.

Replace the MCU.

Symptom:

Garbled characters appear along with the messages CALL CONNECTED and SESSION STARTS.

If you are using an RS-232 cable to connect to the MCU/MCA to an ADM3/5 terminal, make sure that pin 22 is disconnected.

Symptom:

No response when you type <CR> or AT at the terminal.

1. Press Program key and dial 28 to make sure you are in terminal mode.
2. Make sure your PC or terminal's power is on and you are on-line.
3. If the equipment connected to your MCU/MCA is not configured as Data Terminal Equipment, you will need to connect using a null modem cable.
4. Make sure the MCU/MCA is receiving external power. Check to see that the power cables are connected properly and the external power supply is turned on.

5 If you have a display on your phone:

- Press the Program key and dial 63 to get into EIA Monitor mode.
- Check to see that the MCU/MCA is receiving signals from your terminal by watching the RXD indicator on the display while entering carriage returns on the keyboard.
- If the indicator flashes, the connection is correct. If not, check the cable to make sure it is standard RS-232 and is properly connected.

6 Press Program key and dial 62 to ensure that the MCU/MCA is in the asynchronous mode). Press Program key and dial 20 to change to the asynchronous mode.

7 For MCA, if the unit does not have a display, press Program key and dial 20. If you hear a beep, the MCA is in synchronous mode. Change the baud rate to an appropriate asynchronous rate (Program key and dial 22), then press Program key and dial 20 to switch to asynchronous mode.

8 Press Program key and dial * to ensure that the MCA is in the idle mode. Press Release key to ensure that the MCU is in the idle mode.

Symptom:

The RELEASED prompt is not displayed when you disconnect the call.

Some terminals may drop the DTR with a break. If this happens, RELEASED is not displayed.

Symptom:

The prompt CALL CONNECTED.SESSION STARTS is followed by RELEASED.

Check the configuration parameters of the far end data device. If they do not match those of your MCU/MCA, the call will be dropped. You will need to change the parameters of your MCU/MCA to match the end data device.

Symptom:

Garbled prompts are sent to your terminal when you type <CR>.

Enter a period (.) followed by <CR> to perform an autoparity.

Symptom:

You are connected to a host computer, but get no response when you try to log on.

1 First, release the call.

2 Turn on Remote Loopback and make the call again.

3 Type some characters at your terminal. If they echo back and appear on your terminal, the problem is with the far end data device. If the characters do not appear on your terminal, the problem is with the MCU/MCA.

4 Call your telephone system administrator.

Symptom:

When making a data call from the initial prompt (or Main menu) in keyboard dialing, you see the prompt CALLING, but no number appears. After 30 seconds you see the prompt NO SYSTEM RESPONSE.

1 First, hold down the break key(s) for two seconds, enter <CR> and try again to make the data call.

2 If the problem persists, your MCU/MCA is probably disabled. Call your telephone system administrator.

Note: No data should be sent to MCU/MCA when the MCU/MCA is idle in asynchronous mode (when there is not active call). You must stop the data flow from the DTE before connecting it to the MCU/MCA

Troubleshooting synchronous problems

Connect a bit error rate tester to the MCU/MCA. Turn Remote Loopback on (P38) and call the far end data module to check the path integrity. If the MCU/MCA could not send data and no asynchronous terminal is available, replace the MCU/MCA.

If an asynchronous terminal is available, try testing the MCU/MCA in asynchronous mode. For assistance troubleshooting in asynchronous mode, see "Troubleshooting asynchronous problems" on page 91. If the MCU/MCA still fails, replace it.

Troubleshooting the MCA

A few special troubleshooting tips apply only to MCA units:

— Check the LED in back of the telephone to see if it is flashing. (If it is steady, reconfigure the MCA in the system or replace it. If LED does not light, the telephone needs external power.)

— Ensure that the data cable from the terminal or PC is connected to the MCA.

— If a display is attached to the MCA, check data parameters using Meridian Communications Adaptor user guide.

— Ensure that the transformer is plugged in to the closet power.

— Check that the MCA cable connects to the telephone and has not been pinched.

Troubleshooting the MCU

The LED on the MCU's cover indicates the functional status as well as the power-up diagnostics results. Power up the MCU while observing the LED.

— If the LED flashes (two counts on, one count off) and then turns off and stays off, the MCU has passed the self test and established communication with the Meridian 1. This indicates the MCU is fully functional and ready. At this point, if a call is made to/from the MCU, the LED will go on upon call connection and will stay on for the duration of the call.

— If the LED does not turn on and none of the MCU functions respond, replace the power supply and try again.

— If the LED does not turn on but the MCU functions properly, the LED is not functional. Replace the MCU.

— If the LED flashes (one count on, one count off), it indicates a self test failure. Replace the MCU.

— If the LED flashes (two counts on, one count off) it indicates a loss of communication between the MCU and the Meridian 1. Make sure the line cord is plugged into the MCU and the wall jack.

Far-end loop back check

For a far-end loopback check, establish a data connection between the MCU and any data module, then use an external bit error rate tester to check the path integrity.

> ***Note:*** It is not recommended to use a hardware loopback plug in synchronous mode.

Index

Numerics

80C31 (Signetics) microprocessor, 56
8530 communications controller, 56

A

A44, 55
A64, 55
access errors, 55
adapter cables, 75
administration summary, 79
asynchronous mode
    baud rates, 44, 64
    features, 14
    selecting, 22
    troubleshooting problems, 91
AT commands, 49
authorization codes, 54
Autobaud feature, 44
Autodial feature, 39
    programming, 43
    See also Data Autodial feature
autodialing, 35
Autoparity feature, 44

B

baud rates
    asynchronous mode, 64
    changing, 24
    DTE, 58
    provided by keyboard, 44
    synchronous mode, 64
busy calls, 54

C

cabling, installing, 76
calls
    answering manually, 47
    AT commands, 49
    busy, 54
    digital trunk, 54
    disconnecting from host, 42
    handling variations, 54
    manual data, 35
    NT protocols, 45
    Ring Again, 36
    smart modem pool, 38, 55
    to local host, 38
    See also host calls
CCITT V.35 leads, 67
commands
    AT, 49
    NT, 45
    Program key, 22
    program key, 18
    V.25 bis mode, 63
communications software, 10
configurations
    software support, 12
configurations, hardware, 77
configuring
    MCA for synchronous data connections, 82
    V.35 interface, 71

D

Data Adapter Device, Meridian, 55
data bits

DTE, 58
data call monitor, 23
Data Directory Number feature. *See* DDN (Data Directory Number) feature
data parameters, 58
data rates. *See* baud rates
daughterboard, 72
DCE configurations, 57
dialing
keyboard, 44
MCA keypad, 36
NT, 47
dialing modifiers, 52
digital to analog converters, 56
digital trunk calls, 54
Digital Trunk Interface (DTI) trunks, 10
disconnecting host calls, 42
display parameters, 27
DM-DM protocol, 70
documents, related, 16
DTE (Data Terminal Equipment)
communication with MCA, 58
communication with MCU, 58
configurations, 57
interface, 77
V.25 bis automatic calling, 62
V.35 (CCITT) leads, 67
DTE interface, installing, 77
DTI (Digital Trunk Interface) trunks, 10
duplex
full, 31
half, 31

E

echo canceller, 32
EIA RS-232 leads/signals, 65
emulation, selecting, 30
environmental requirements, 69
error rates, 57
errors
access, 55
external clock, 31

F

far end loopback check, 95
features, 14
field replaceable parts, 69
field-replaceable parts, 78
Forced DCD, 26
Forced DTR, 26
full duplex, 31

H

half duplex, 31
Help menus, 45
host calls
local, 38, 42
remote, 42
host mode, 25
Hotline, 25

I

installation procedures, 71
installing
MCA, 82
MCU, 80
power supply board, 87
interchange circuits, 62
internal clock, 31
ISDLC/XDLC, 61
ISDN Primary Rate Interface channel, 10
ISO-2110 to ISO-2593 adapter cable, 75

J

jumper locations, 73, 74

K

key commands, 17
keyboard, 44
keypad features, MCU, 38

L

language selection, 23
LD 11, 79
Learn Script/Delete Script menus, 46
Least Cost Routing, 54

LEDs, 94
local hosts
calling, 38
disconnecting from, 42
See also host calls
lock data parameters, 29

M

M2000 series telephones, 82
M2006/M2008 telephone option boards, 90
M50747 (Mitsubishi) microprocessor, 56
maintenance procedures, 91
manual data calls, making, 35
MBTF (mean time between failures), 69
MCA (Meridian Communications Adapter)
communication with DTE, 58
configuring, 52
connections to Meridian Modular Telephone, 59
described, 9
features, 14
functional description, 11
installing, 71, 82
keypad, 17
keypad dialing, 36
memory configurations, 57
operating parameters, 61
performance specifications, 57
power supply, 64
removing, 82
troubleshooting, 94
MCU (Meridian Communications Unit)
8530 communications controller, 56
communication with DTE, 58
configuring, 52
described, 9
digital to analog converters, 56
features, 14
functional description, 12
installing, 71, 80
keypad, 17, 37
keypad features, 38
memory configurations, 57
operating parameters, 61
performance specifications, 57
power supply, 56, 63, 64
processing, power, and protocols, 14
removing, 80
troubleshooting, 94
mean time between failures (MTBF), 69
mean time to repair (MTTR), 69
memory
MCA configurations, 57
MCU configurations, 57
menus. *See* entries for specific menus
Meridian Communications Adapter. *See* MCA (Meridian Communications Adapter)
Meridian Communications Unit. *See* MCU (Meridian Communications Unit)
Meridian Data adapter device, 55
Meridian Modular Telephone
connections to MCA, 60
interface to MCU, 63
Meridian Modular Telephone. *See* MMT (Meridian Modular Telephone)
microprocessors, 56
Mitsubishi M50747 microprocessor, 56
modem mode, 31
Modify menu, 46
modifying. *See* programming
motherboard, 14
MPH mode
MCU configuration, 62
software required, 57
MTTR (mean time to repair), 69

N

network mode, 31
NT protocols
making answering calls, 45
menu driven interface, 44
rules, 47

O

Off Hook Queuing, 54
operating parameters, 58, 61
setting, 58

P

parallel/serial conversions, 55
parameters
    data, 58
    display, 27
    lock data, 29
    reset data, 29
    setting data, 58
parity, 58
    changing, 24
parts, field-replaceable, 69, 78
power requirements, 69
power supplies and power units
    MCA and MPDA, 64, 88
power supply
    MCA, 64
    MCU, 64
power supply board
    installing, 87
    removing, 88
Power supply boards
    MCA and MPDA, 64, 88
power supply, MCU, 56, 63
power-up diagnostics, 94
Program key, 17
    commands, 22
program key commands, 18
programming
    Autodial feature, 43
    Speed Call feature, 43
protocols
    software support, 12
    supported by MCA/MCU, 14, 70
    See also AT protocols; DM-DM protocol; NT protocols; T-Link protocol
PSDS (Public Switched Data Service), 10, 70
    turning on/off, 32

R

remote hosts
    disconnecting from, 42
    See also host calls
Remote Loopback, 27
removing
    MCA, 82
    MCU, 80
    power supply board, 88
reset data parameters, 29
Ring Again feature, 36, 40
ROM
    MCA memory configurations, 57
    MCU memory configuration, 57
RS-232
    jumper locations, 73
RS-232 interface
    drivers, 56
    interchange circuits, 62
    specifications, 61
RS-232 monitor, 22
RTS, turning on/off, 33

S

S registers, 52
Script menu, 46
separation distances, maximum, 76
serial/parallel conversions, 55
Signetics 80C31 microprocessor, 56
smart modem pool calls, 38, 55
software
    communications, 10
    required for MPH, 57
    support, 12
specifications, MCA/MCU, 61
Speed Call feature, 39, 43
stop bits, 44, 58
synchronous mode
    baud rates, 64
    configuring MCA for, 82
    Data adapter device timer circuitry, 55
    features, 15
    selecting, 22
    troubleshooting problems, 93

T

telephone interface, 63
telephones

M2000 series, 82, 83
Terminal mode, 25
timeout, 27
T-Link protocol, 70
transmission modes, 58
troubleshooting
asynchronous mode problems, 91
MCA, 94
MCU, 94
synchronous mode problems, 93
trunk interworking, 12

U

USART, 56

V

V.25 bis automatic calling, 62
V.25 bis mode, 33
V.35 interface
CCITT leads, 67
configuring, 71
drivers, 56
jumper locations, 73
specifications, 61
VDN key assignment, 34
Virtual Leased Line, 26
voice call origination, 34

Meridian 1

Meridian Communications Unit and Meridian Communications Adapter

Description, installation, administration, operation

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